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OCEAN PASSAGES FOR THE WORLD

COMPILED BY
Rear Admiral BOYLE T. SOMERVILLE, C.M.G.

SECOND EDITION
REVISED BY
Commander A. F. B. WOODHOUSE, R.N.

PRINTED BY ORDER OF THE
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OF THE ADMIRALTY

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CAUTION

In this work the bearings are referred to the True compass, and when given in degrees are reckoned clockwise, from 000° (North) to 359°.

The latitudes and longitudes given in the text are approximate.

The distances are expressed in sea-miles of 60 to a degree of latitude.

A cable's length is assumed to be equal to the tenth part of a sea-mile. It is often accepted as being one-tenth of a nautical mile.

The depths are given below chart datum level where not otherwise stated.

Heights on the land are given above mean level of high water spring tides.

Figures in brackets given after those denoting feet, fathoms and yards are their equivalents in metres.

Time is expressed in the four-figure notation commencing at midnight.

The term " steam vessel " used herein includes any vessel propelled by machinery.

A name in brackets, immediately following another name is the obsolete name which is still shown on the Admiralty charts. As a general rule, the bracketted name is only inserted once in each route in which it appears.

ADVERTISEMENT

THIS, THE SECOND EDITION, prepared by Commander A. F. B. Woodhouse, R.N. replaces the first edition compiled by Rear-Admiral Boyle T. Somerville, C.M.G., and published in 1923.

Most of the material used in the first edition for the routes has been retained, but the lay-out has been amended; new routes have been added, and some omitted in this edition, due mainly to the increase or decrease, for various causes, of the importance of the port of departure or destination. The latest Admiralty charts and publications have been consulted, and information extracted therefrom when found suitable for this edition.

More routes have been included for smaller vessels to enable them to make the longer ocean passages, and to avoid bad weather as far as possible.

The routes for sailing-vessels are retained substantially as originally written, though the lay-out has been amended to conform to that used for steam-vessels.

Section D. has been added to the book; it contains a selection of Notes and Cautions which apply to more than one of the routes in Sections B. and C.

The system of indexing routes has been revised.

The whole description of the winds and weather has been re-written by the Director of Naval Meteorological Service of the Admiralty; and that of the currents by the Marine Branch of the Meteorological Office of the Air Ministry.

Mariners are invited, in the interests of navigation, to forward to The Hydrographer, Admiralty, London, S.W.1., any new ocean routes with which they are acquainted, or navigating notes in addition or correction of those appearing herein.

The following list, extracted from the advertisement to the first edition, shows the authorities from whom the information for both steamship and sailing-ship routes were derived:—

Admiralty Sailing Directions and Pilots for all coasts and oceans of the world.
Admiralty Distance Tables.
Admiralty Route Charts.
Pilot Charts for the Atlantic and Indian Oceans, published by the Meteorological Office.
Pilot Charts for all oceans, published by the Hydrographic Office of the United States Navy Department.

Information supplied by the Manager, or by the Marine Superintendents of the following British steamship companies:—

Anglo-Saxon Petroleum Company, Ltd.
Asiatic Steam Navigation Company, Ltd.
Australasian United Steam Navigation Company, Ltd.
Booth Steamship Company, Ltd.
British India Steam Navigation Company, Ltd.
British and North Atlantic Steam Navigation Company, Ltd. (White Star, Dominion, and American Lines).
British Tanker Company, Ltd.
Canadian Pacific Ocean Services, Ltd.
Cayzer, Irvine, and Company, Ltd.
Cunard Steamship Company, Ltd.
Eagle Oil Transport Company, Ltd.
Elder, Dempster Company, Ltd.
Ellerman Line, Ltd.
Alfred Holt and Company, Ltd.
Lamport and Holt, Ltd.
Oceanic Steam Navigation Company (White Star Line).
Orient Steam Navigation Company, Ltd.
Pacific Steam Navigation Company, Ltd.
Peninsular and Oriental Steam Navigation Company, Ltd.
Royal Mail Steam Packet Company.
Union Steamship Company of New Zealand, Ltd.
Union Castle Mail Steamship Company, Ltd.

and by the Managers of the following sailing-ship companies:—

Messrs. J. Hardie and Company, Glasgow.
Messrs. Thos. Law and Company (Shire Line), Glasgow.

Personal navigating notes upon the trade-routes, with which they are best acquainted have been received from the Commanders of many mercantile vessels, and from Marine Superintendents of several of the various lines mentioned above, and have been embodied in this book.

Hydrographic Department,
Admiralty, London.
1st. May, 1950.

A. G. N. Wyatt,
Vice-Admiral and
Hydrographer of the Navy.

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5302 World climatic chart—Sheet II, July ... ...
5310 World current chart ... ...
5305 Steamship routes—Atlantic ocean ... ...
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Introductory Remarks

THE ROUTES FOR SHIPS voyaging through the various oceans, to be described in the following pages, have been laid down with special reference to the winds and currents that would be experienced on each particular passage. In regions where seasonal changes, such as monsoons, or the appearance of floating ice, occur at certain times of the year, routes are given to suit these seasons.

Routes are provided both for steamships and for sailing-ships. As these differ so widely in character, it has been considered to be more convenient to place them under two separate sections, one for steam-ship passages, and one for sailing-ship passages.

Charts (5305, 5306 and 5307) illustrating steamship routes in the Atlantic, Indian and Pacific oceans, respectively, and also one general chart (5308) of sailing-ship routes are appended, and will be found in a pocket on the cover of the book.

Steamships have been regarded as belonging to three categories, as follows:—

(1) Full-powered, or able to maintain a sea-going speed of 15 knots or over.

(2) Moderate-powered, or able to maintain a sea-going speed of from 10 to 15 knots, and

(3) Low-powered, or having a sea-going speed of less than 10 knots.

The routes given herein are intended mainly for vessels of the second and third categories. Those of the first category would, in most instances, take the nearest navigable route between ports; each ship being governed, in so doing, solely by her " radius of action," *i.e.*, the number of miles of which her bunker-fuel is capable of conveying her. Yet even such a ship would find, in some instances, a considerable saving in wear and tear, in time, and in fuel by following the route here laid down; as, for example, on a passage to the westward during the south-west monsoon of the Arabian sea.

The routes given in this book are ocean passages, properly so considered. For coastal passages, the navigator is referred to the appropriate Admiralty Sailing Directions for the coast in question (see Chart Y in pocket). Nevertheless, in several instances an ocean passage has often to be combined with a coastal passage; such, for example, as on a voyage from the English channel to Rio de La Plata, along the coast of South America from Recife to the southward; in such cases, the coastal part of the voyage is necessarily described together with the trans-oceanic part. A special chapter (Section C., Part II, Chapter II) has also been devoted to the sailing-ship passages through the many channels between the islands of the Eastern archipelago, connecting the Indian and Pacific oceans.

As the track, or a portion of the track, of many of the routes, lies along a Great Circle, the following charts or diagrams, all of which can be obtained from any Agent for the sale of Admiralty charts and publications, will prove of use for the rapid transfer of such tracks to the Mercator projection, on which the majority of Admiralty charts are constructed:—

Diagram 5029—Great Circle diagram for use in Navigation, Aviation and Wireless Telegraphy.

Chart 11a.—North Atlantic ocean—gnomonic chart for facilitating Great Circle sailing.

Chart 18a.—South Atlantic and Southern oceans—gnomonic chart for facilitating Great Circle sailing.

Chart 132—Indian and Southern oceans—gnomonic chart for facilitating Great Circle sailing.

Chart 42a.—North Pacific ocean—gnomonic chart for facilitating Great Circle sailing.

Chart 53a.—South Pacific and Southern oceans—gnomonic chart for facilitating Great Circle sailing.

Note.—Charts 42a. and 53a. have a greater range of latitude than Charts 11a., 18a., or 132 extending 15° to 20° S. or N. of the equator respectively. By a suitable re-numbering of the degrees of longitude, either can be adapted for use in other oceans, the geographical position of the point of departure and destination being inserted in pencil.

Division of the book

The book has been divided in four sections as follows:—

Section A.—This contains a general statement respecting the wind and current circulations, the weather, and ice conditions throughout the world, together with a brief discussion on their causes.

A short description of Tropical revolving storms and the localities in which they may be expected, together with practical rules for avoiding them, is also included in this section.

Further information regarding winds and weather, currents, and ice, as they affect each area, will be found in Chapter I of each Part of Section B.

Section B.—This section is divided into four parts, each dealing with the winds and weather, currents, ice and the steamship routes in oceans and seas as follows:—

Part I.—Atlantic ocean.
Part II.—Mediterranean and Black seas.
Part III.—Red sea, Indian ocean and Persian gulf.
Part IV.—Pacific ocean.

Section C.—This section is divided into three parts only, devoted exclusively to sailingship routes of the world. The area covered by each part is as follows:—

Part I.—Atlantic ocean and Mediterranean sea.
Part II.—Indian ocean, Eastern archipelago and Red sea.
Part III.—Pacific ocean.

Section D.—This section is divided into three parts. The area covered by each part is as follows:—

Part I.—Atlantic ocean and Mediterranean sea.
Part II.—Indian ocean, Persian gulf and Eastern archipelago.
Part III.—Pacific ocean.

Indexes

The following indexes have been compiled. *See* also page 5 and page 6

Route indexes—There are two indexes for routes, one at the end of each route section, B and C. Both are alphabetical and cover the whole world; a note at the beginning of each explains the system used.

Index to winds and weather, currents, and ice.—An index to these subjects appears at the beginning of Section A, and of Chapter I of each part of Section B. The indexes are arranged in the order of the paragraphs as they appear in the text.

Index to Navigational notes and cautions.—An index to these notes and cautions is printed at the beginning of each part of Section D. Where a Note or Caution, printed in Section D. applies to any route described in this book, a notation (in italics) is made at the bottom of the appropriate page in Sections B. and C.; thus :— *See Section D. Part 1. Index on pages 340* and *341.*

Section A

OCEANIC WINDS, WEATHER, ICE AND CURRENTS

General Statement

Details of the Winds, Weather, Ice and Currents affecting the various Oceans are given in Chapter I of Parts I, II, III, and IV of Section B.

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SECTION A

Chapter I

WINDS AND WEATHER—ICE

PRESSURE AND WIND

Before entering into a description of Oceanic winds, it is necessary to describe briefly the causes of wind, and the laws which govern its direction and strength over the sea.

Atmospheric pressure

The atmosphere, by reason of its weight exerts a pressure upon the surface of the Earth the mean value of which is rather under 15 lbs. per square inch. Atmospheric pressure is normally, however, measured in millibars, the mean pressure at sea level being about 1013 millibars.

This pressure is not, however, everywhere and at all times the same. In certain parts of the world, pressure is found to be permanently above the mean, while in other parts it is permanently below the mean. These regions are spoken of as being regions of " High Pressure " and of " Low Pressure " respectively.

In addition to these permanent pressure regions there arise from time to time temporary areas of high or low pressure, *i.e.* relatively high or low with respect to the normal pressure of the region in which they occur.

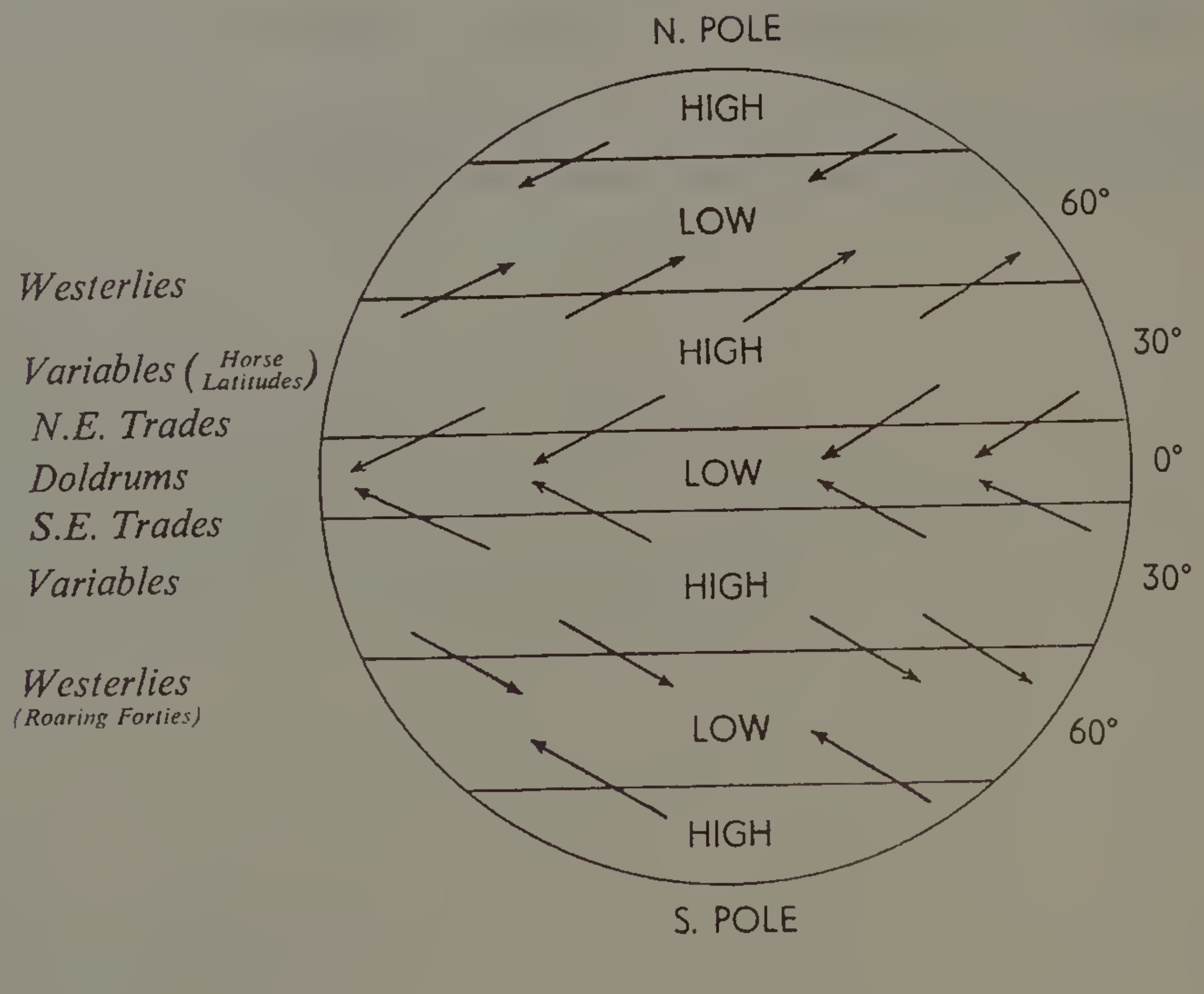

Fig. 1.

Wind

As a result of the differences of pressure mentioned above there is a tendency for air to flow from regions of high pressure towards those of low pressure.

Effect of the Earth's rotation and surface friction

The effect of the Earth's rotation is to cause the air flow to be deflected to the right in the northern hemisphere, and to the left in the southern hemisphere, resulting in an anti-clockwise circulation of the wind around an area of low pressure in the northern hemisphere, and a clockwise circulation in the southern hemisphere. Such circulations around areas of low pressure are termed " cyclonic." Conversely the wind circulates in a clockwise direction around an area of high pressure in the northern hemisphere and in an anti-clockwise direction in the southern hemisphere, such circulations being termed " anticyclonic." The strength of the wind at any given time depends upon the " pressure gradient " *i.e.* on the spacing of the isobars—or lines joining places having the same barometric pressure. Isobars are, in fact, analogous to the contour lines of a map; the closer they are together the steeper is the pressure gradient and the stronger the resulting wind.

The effect of surface friction is twofold. Firstly it causes a reduction in the strength of the wind at the surface, and secondly it causes it to be deflected some 10°–20° across the isobars—inwards, towards the centre of low pressure or outwards away from the centre of high pressure.

Buys Ballots Law

From the facts described above the following rule, named after its originator, is derived:—

" If you face the wind the centre of low pressure will be from 8–12 points on your right hand in the northern hemisphere, and on your left hand in the southern hemisphere."

General Planetary Distribution of Pressure and Winds

The distribution of pressure and the winds which would result over a uniform earth entirely covered by water are shown in Fig. 1, together with the terms long used by seamen to describe the various regions.

Effect of variations in the Sun's Declination

The effect of the annual march of the sun in declination is to cause the belts of pressure and their associated winds to move towards the north in the northern summer, and towards the south in the southern summer. The amount of this oscillation is much smaller than that of the sun itself, and in general amounts only to some 4° of latitude. This movement, furthermore, lags some 6 to 8 weeks behind that of the sun, so that, in general, the belts described above and shown in Fig. 1 reach their most northerly position in July-August and their most southerly position in January-February.

Effect of the distribution of Land and Sea

The effect of large land masses is to modify greatly the planetary distribution of pressure and wind shown in Fig. 1. The belts of high pressure in 30° North and South are split up into separate cells of high pressure (or anticyclones) situated over the eastern part of each of the Oceans; the belt of low pressure in about 60° N. is likewise modified into separate areas of low pressure situated in the vicinity of Iceland and the Aleutian Islands. In the southern hemisphere, there is little or no land in the area covered by this low pressure belt, and consequently it extends uninterruptedly around the earth.

Superimposed upon these modifications of the general planetary distribution of pressure, there is a tendency for pressure to become relatively high over land masses in the winter, and relatively low in the summer. This seasonal change in pressure distribution causes corresponding modifications to the oceanic winds in the vicinity.

OCEANIC WINDS AND WEATHER

The general distribution of the oceanic winds described hereunder is best seen from a study of World Climatic Charts 5301 and 5302 which are included in this book.

For more precise information relating to oceanic winds and weather the mariner is referred to the atlases of monthly meteorological charts of the several oceans, published by the Marine Branch of the Meteorological Office, Air Ministry.

For detailed information relating to specific localities reference should be made to the appropriate volume of the Admiralty Sailing Directions. *See* Chart Y in pocket at the end of this book.

The Doldrums

The Doldrums is that part of the ocean lying in the equatorial trough of low pressure situated between the Trade winds of the two hemispheres. The normal position of the Doldrums in February and August are shown in Climatic Charts 5301 and 5302. The characteristic features of this zone are calms and light variable winds alternating with squalls, heavy rains and thunderstorms. The width of the zone averages about 200-300 miles but there are very considerable seasonal and day to day variations. The severity of the weather also varies greatly; at times a ship may cross the belt and only experience a few scattered showers, while on other occasions severe squalls, violent thunderstorms and much heavy rain may be encountered. It has been found that doldrum weather is generally worst when the strength of the Trade winds is greater than the normal, and best when the Trades are abnormally light.

The Trade Winds

Between the Doldrums and the oceanic high pressure areas in each hemisphere blow the Trade Winds, northeasterly in the northern hemisphere and southeasterly in the southern hemisphere. These winds blow permanently and with great steadiness and persistence throughout the year, each embracing a belt of some 1200 miles of latitude. The Trade winds, however, do not blow in the North Indian ocean or in the western part of the North Pacific, where their place is taken by the Monsoons (see below).

The average strength of the Trades is about 4, though variations occur between different oceans and at different seasons.

Weather in this zone is generally fair or fine with small detached cumulus clouds. On the eastern sides of the oceans cloud amounts are small and rainfall very scanty, while on the western sides cloud amounts are larger and rain is comparatively frequent, being a maximum in the summer months. Both cloud and the frequency and intensity of rain increase towards the doldrums.

Poor visibility occurs fairly frequently in the eastern parts of the trade wind belts, due in part to mist or fog forming at times over the cold currents, and in part to sand and dust being carried out to sea by the prevailing offshore winds. On the western sides of the oceans visibility is good—except when reduced by heavy rain—and fog is very rare.

CAUTION. The generally fair weather of the Trades is liable, at certain seasons and in certain localities, to be interrupted by the dangerous Tropical Storms, which are described in detail on pages 17 to 21.

The Variables

In the areas covered by the oceanic anticyclones and situated between the Trade Winds and the Westerlies further polewards, there exist zones of light and variable winds. In the North Atlantic, this region is known as the " Horse Latitudes " due to the number of horses which, in the days of sail, had to be thrown overboard, owing to shortage of fodder and water arising from the undue protraction of the voyage through these light and baffling winds.

The weather in these zones is generally fine, cloud amounts are small and rainfall very scanty.

The Westerlies

On the polar sides of the oceanic anticyclones the wind direction becomes prevailing westerly. These winds are not, however, permanent winds in the same way as are the trade winds on the equatorial sides of the " highs." The constant passage of depressions (see page 14) from a westerly to an easterly point across this zone causes the winds to vary greatly both in direction and strength.

Gales are frequent—especially in winter; the weather is subject to rapid changes and fine weather is seldom prolonged. In the Southern ocean, the frequency of gales in the belt encircling the earth, south of about latitude 40°S. has earned for it the name of the " Roaring Forties."

Climatic Charts 5301 and 5302 show, for January and July respectively, the areas where gales are most frequent.

In the northern hemisphere fog is common in the western parts of this zone during the summer. It also occurs fairly frequently in the Southern ocean in the summer of that hemisphere. Areas where fog is likely on 5 or more days per month are shown on Charts 5301 and 5302.

Ice may be encountered in certain parts of this zone at certain seasons. Approximate limits are shown on the climatic charts.

A more detailed statement about fog and ice is given in pages 21 and 22.

The Polar Regions

The greater part of the region lying on the polar sides of the Westerlies is unnavigable on account of ice, and need not therefore be dealt with in much detail. The prevailing wind is generally from some easterly point and gales are common in the winter months, though less so than in the zones of the Westerlies. Weather is usually very cloudy and fog is frequent in the summer months.

SEASONAL WINDS AND MONSOONS

In certain parts of the oceans the general distribution of pressure and wind as described in the preceding paragraphs is much modified by the seasonal heating and cooling of adjacent large land masses. The annual range of sea temperature in the open ocean is comparatively small, whereas large land masses become greatly heated during the summer months and much cooled during the winter. The alternate heating and cooling is communicated to the air in these regions, and results in the formation of areas of low and high pressure respectively. This re-distribution of pressure results in a seasonal reversal of the prevailing wind in the adjacent oceans.

The most important oceanic areas subject to these seasonal winds are the Indian ocean and Western Pacific, and those adjacent to the coasts of West Africa and Western Central America.

LOCAL WINDS

Though not strictly speaking "oceanic," certain locally caused winds are sufficiently widespread in their distribution, and affect sufficient routes to justify their treatment here on broad lines. It is emphasized, however, that a detailed description of these winds as they affect specific localities must be sought elsewhere—namely in the meteorological section of the appropriate Admiralty Sailing Directions.

Land and Sea Breezes

The regular alternation of land and sea breezes is a conspicuous feature of most tropical and subtropical coasts and islands (other than very small ones). They also occur at times in temperate latitudes in fine settled weather in the summer, though they are here much weaker and less well marked than is the case in lower latitudes.

The cause of these breezes is the unequal heating and cooling of the land and the sea by the sun's radiation. By day the surface of the earth rapidly acquires heat under the influence of the sun's rays, whereas the sea temperature remains virtually unaffected. The heat of the land is communicated to the air in contact with it, which expands and rises. Air from over the sea flows in to take its place, producing an onshore wind known as the Sea Breeze. By night the land rapidly loses heat by radiation, and becomes much colder than the adjacent sea. The air over the land is chilled, becomes denser and heavier, and flows out to sea under the influence of gravity. This constitutes the Land Breeze.

The sea breeze usually sets in at about 1000-1100 local time, attains its maximum strength (usually about Beaufort force 3-4) at about 1400, and dies away about sunset, It extends normally about 20 miles to seaward, though under favourable conditions it has been detected at as much as 100 miles from the coast. The land breeze is usually less well marked and weaker than the sea breeze—often being inappreciable. It starts during the first watch and blows until shortly after sunrise. The effect of these breezes may be to deviate the prevailing wind, to reinforce it, to neutralize it or even to reverse it.

The following factors are favourable to the formation of well marked land and sea breezes:—

(*a*) A dry, desert coast as opposed to forests and swamps.
(*b*) High ground near the coast.
(*c*) A weak prevailing wind.
(*d*) A partly clouded sky, *i.e.* neither overcast nor completely cloudless.

A cold current along the coast also has the effect of favouring the establishment of a well-marked sea breeze.

The breeze produced by two adjacent land masses is the resultant of the two effects. Small islands less than 5-10 miles in diameter will not usually produce land and sea breezes.

Katabatic Winds

These are offshore winds caused by the drainage of cold air from high ground under the influence of gravity. In temperate and high latitudes where the coast is backed by snow-covered mountains, intense radiation from the mountains occurs, which results in the accumulation of a mass of cold air over the high ground. A light general offshore wind suffices to impel this mass of cold air towards the seaward facing slopes, down which it flows with gathering momentum, being felt off the coast as a strong or gale force wind. The usually sudden onset of these winds coupled with their strength makes them a menace to small craft and to ships at anchor.

Among areas where these winds are common are the coasts of Greenland, Norway, the Northern Adriatic and the Eastern parts of the Black sea.

DEPRESSIONS OR LOWS

A low, or depression, appears on a synoptic chart as a series of isobars roughly circular or oval in shape, surrounding an area of low pressure. It is a main feature of the weather at sea in middle latitudes where it is responsible for most of the occasions of strong winds and unsettled weather, though not all depressions are accompanied by strong winds.

Lows vary very much in size and depth; one may be only a hundred miles in diameter and another over two thousand miles; some are deeper than others, a deep low being one in which the pressure is very much lower near the centre than on the outside whereas, on the other hand, a shallow depression is one where the pressure, although low near the centre, is not very much lower than in the surrounding districts.

Note. The bracketed equivalents hereunder refer to the Southern Hemisphere.

In the northern (southern) hemisphere the winds blow round an area of low pressure in an anticlockwise (clockwise) direction; there is also a slight inclination across the isobars towards the

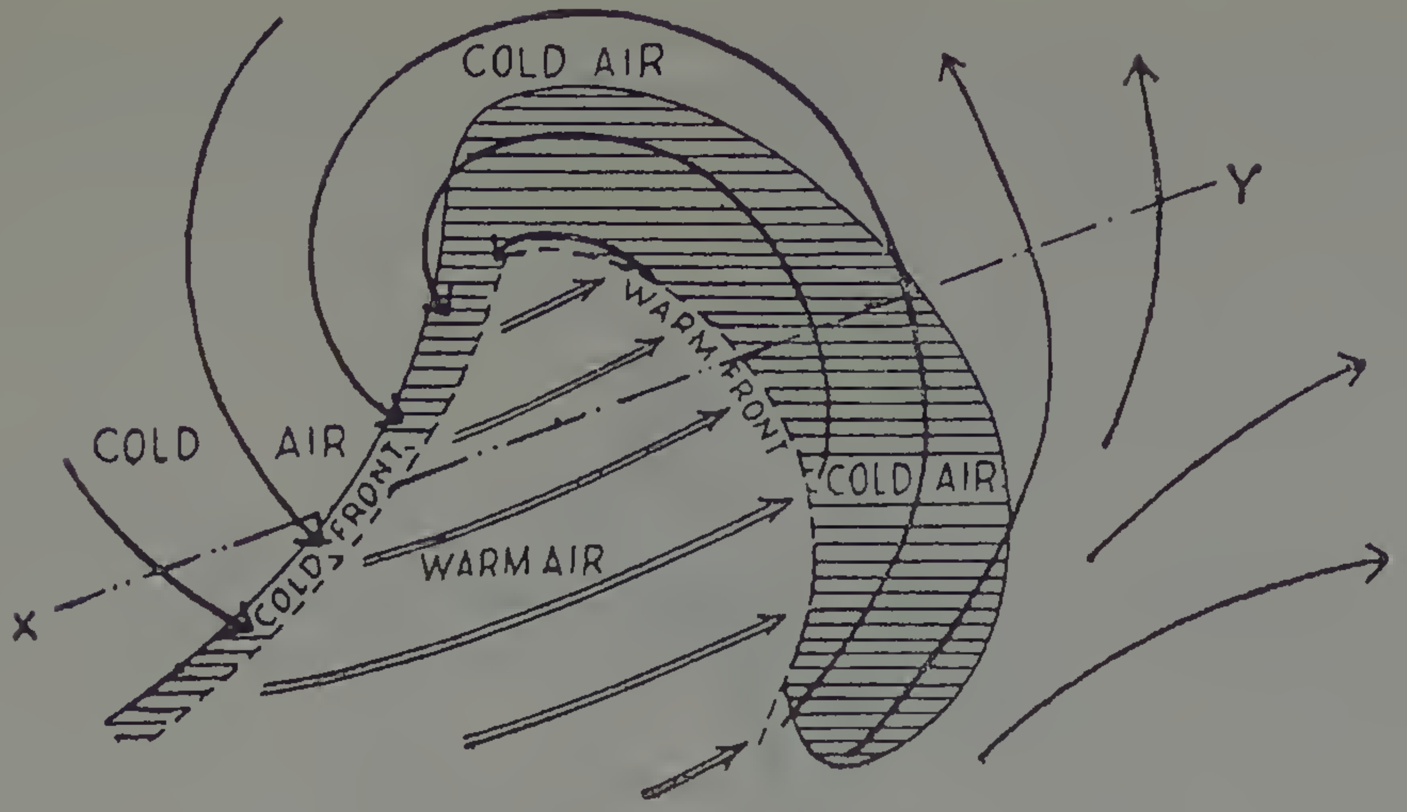

Fig. 2a.

DEVELOPED DEPRESSIONS

Northern Hemisphere

Plan of a developed depression.

The double lines show the flow of the warm air, and the single lines the flow of the cold air. The shading shows the areas where rain (or snow) is most probable. Width of rain belt ahead of warm front is generally between 100 and 200 miles.

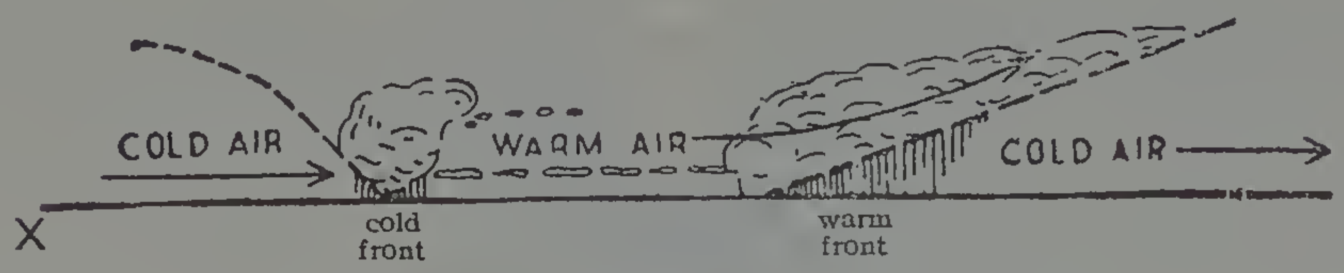

Fig. 2b.

Vertical section of the depression along the line XY.

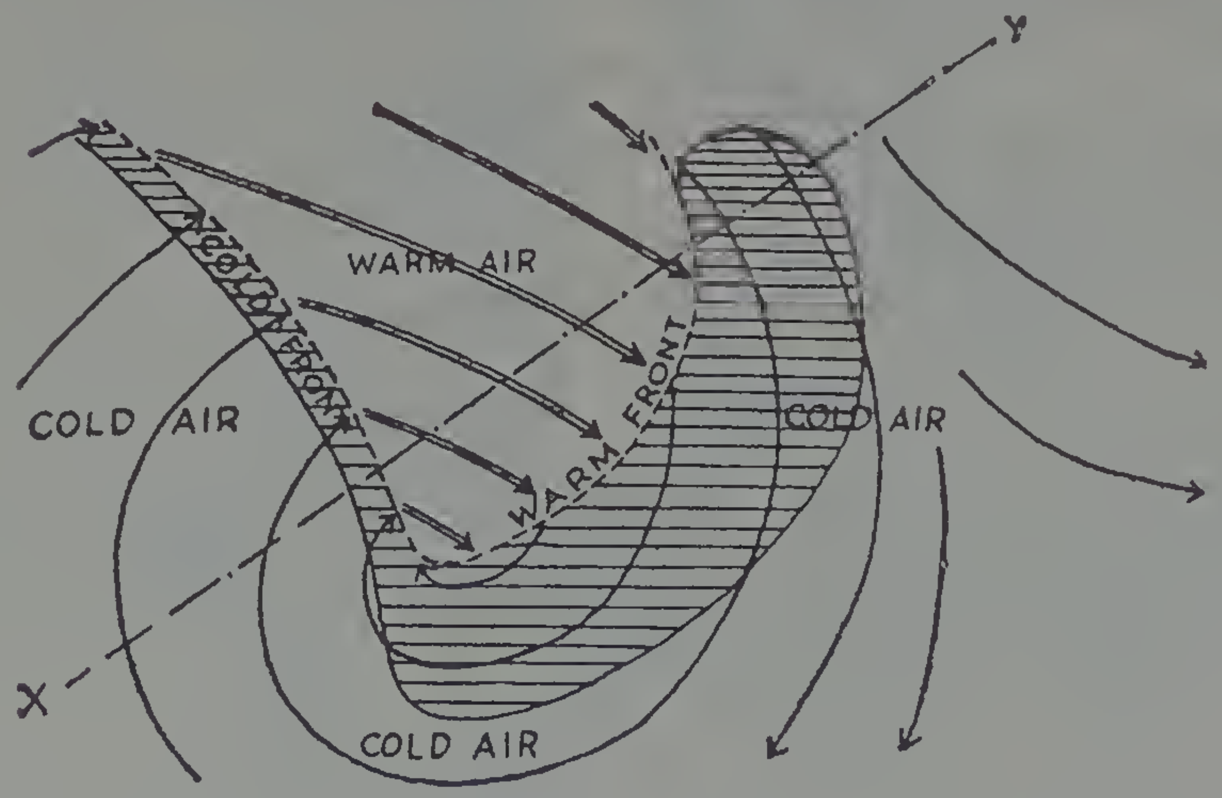

Fig. 3a.

Southern Hemisphere

Plan of a developed depression.

The double lines show the flow of the warm air, and the single lines the flow of the cold air. The shading shows the area where rain (or snow) is most probable. Width of rain belt ahead of warm front is generally between 100 and 200 miles.

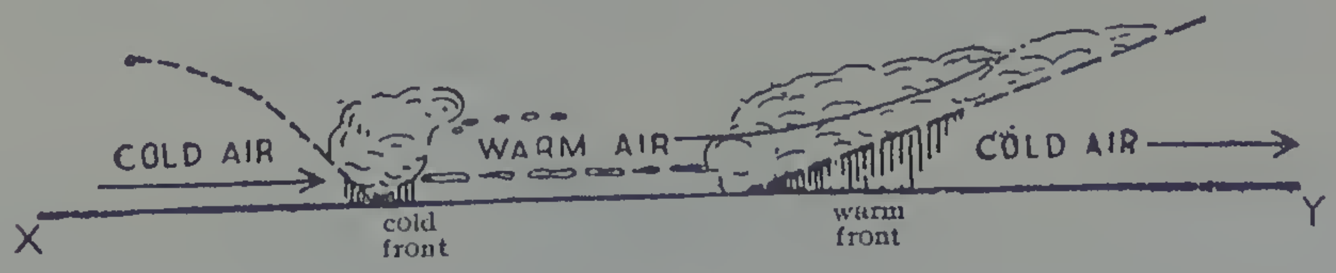

Fig. 3b.

Vertical section of the depression along the line XY

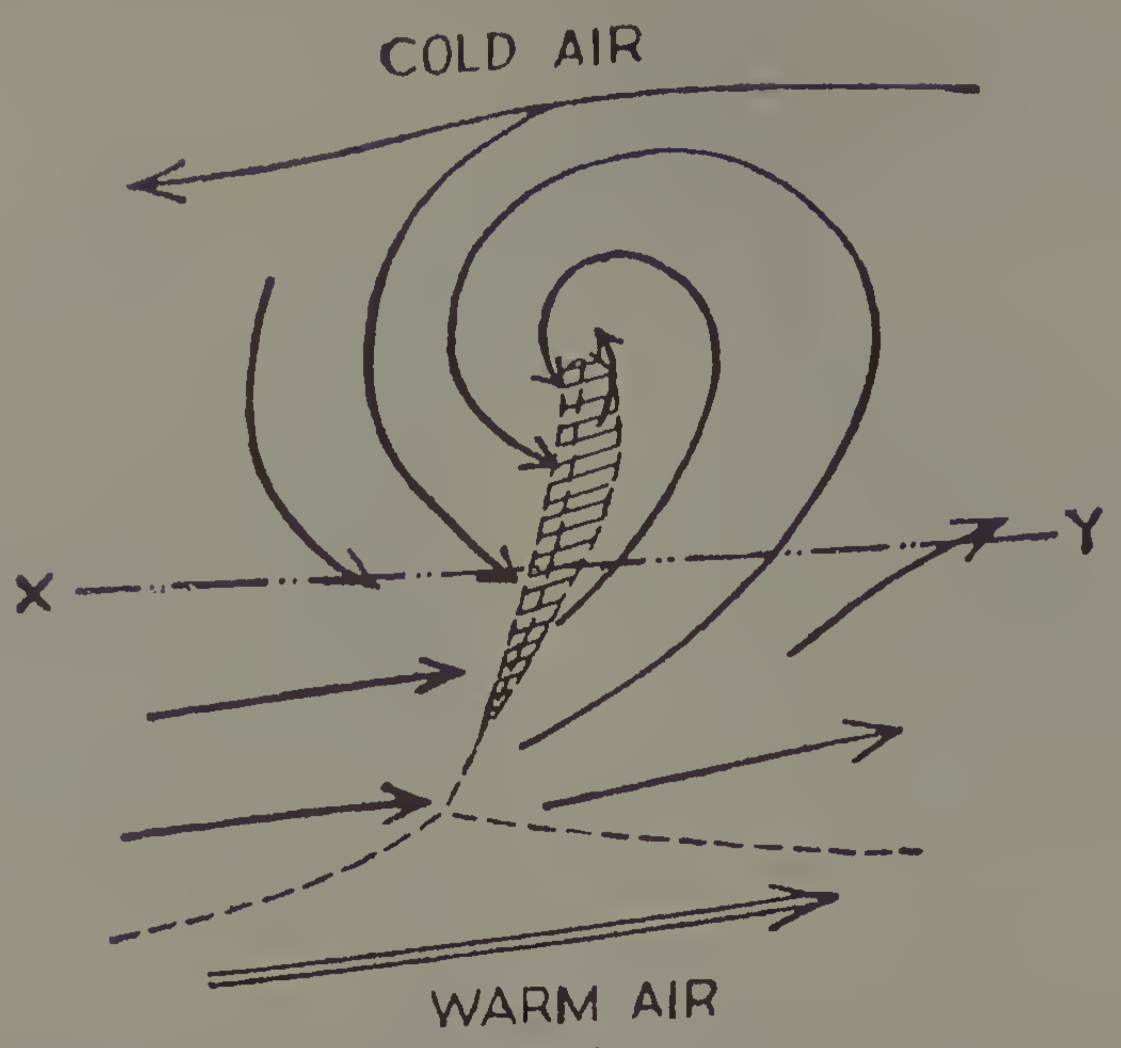

Fig. 4a.

OCCLUDED DEPRESSIONS

Northern Hemisphere

Plan of an occluded depression.

The shading shows the region where rain (or snow) may be expected near the occlusion.

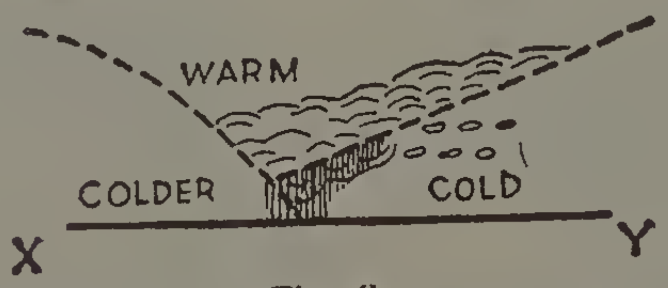

Fig. 4b.

Vertical section of an occlusion of the cold front type.

The air in front of the occlusion is warmer than the air behind it.

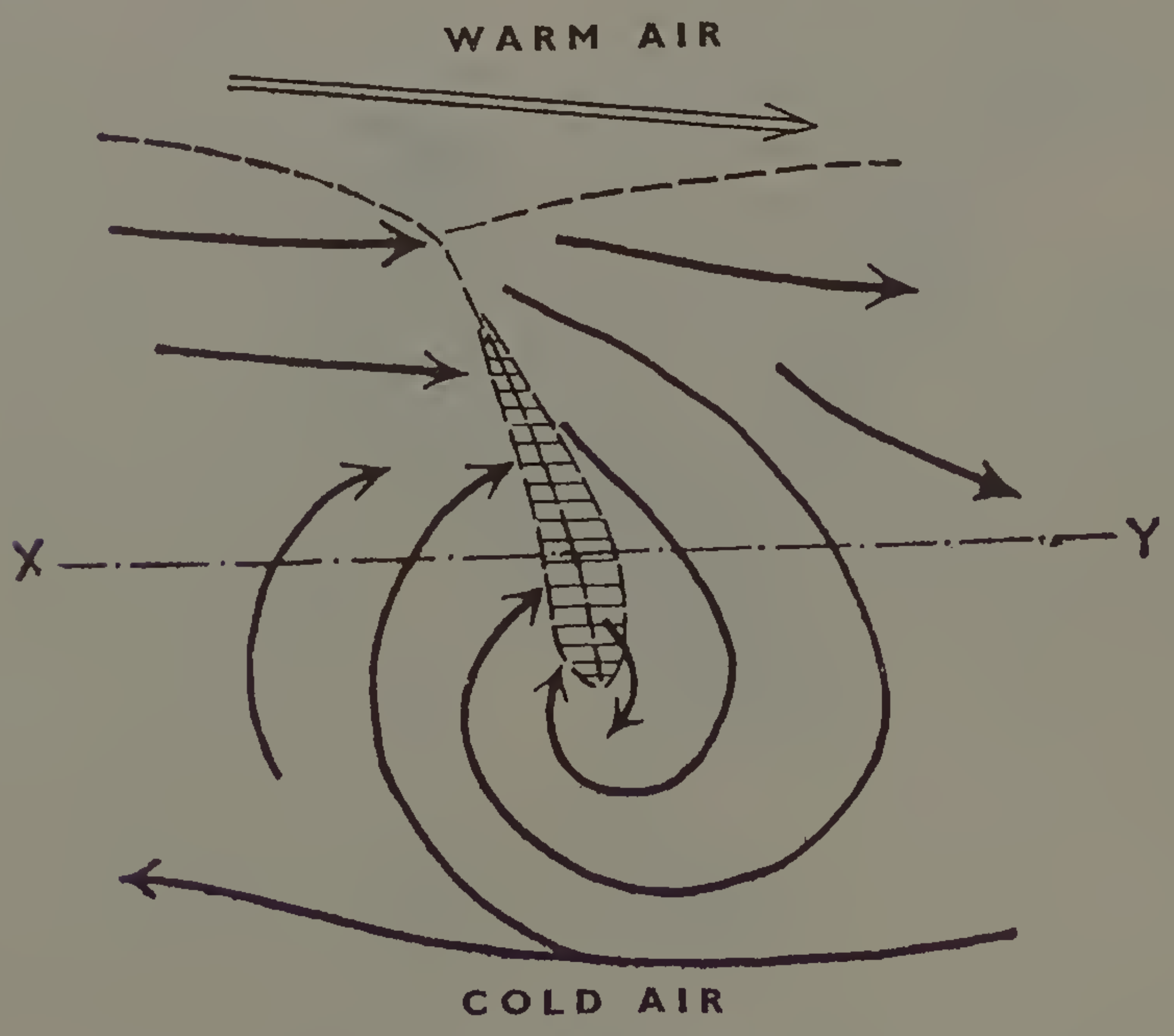

Fig. 5a.

Southern Hemisphere

Plan of an occluded depression.

The shading shows where rain (or snow) may be expected near the occlusion.

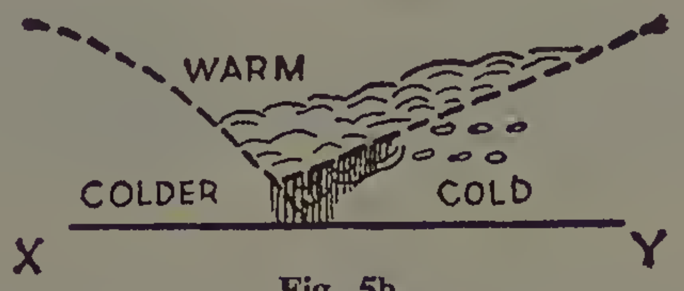

Fig. 5b.

Vertical section of an occlusion of the cold front type.

The air in front of the occlusion is warmer than the air behind it.

lower pressure. Thus the well-known rule for the northern (southern) hemisphere is that when an observer faces the wind the direction of the lowest pressure is from 8 to 12 points to his right (left). The strength of the wind is in all instances closely related to the steepness of the barometric gradient or distance apart of the isobars; the closer the isobars the stronger the wind.

Lows may move in almost any direction, though most often towards north-east (south-east) or east, at a speed of anything between 10 and 40 knots, though occasionally as much as 60, during the middle and most active stage of their existence; they slow down when filling up (*see* " occlusion " below). The life of a low is in the region of 4 to 6 days.

There are usually one or more fronts, probably radiating from the centre, in the area covered by a low; each front on a synoptic chart represents a belt of relatively bad weather, accompanied by a veer (backing) of wind, which marks the change from the weather characteristic of one air mass to that of another. During the first two or three days of its life a low has a warm and a cold front, the area between the two being known as a warm sector because the air has come from a warmer locality than that which is outside the sector (see Figs. 2a and 3a). Warm air is lighter than cold air and it rises over the cold air ahead of the warm front as shown in Figs. 2b and 3b; this causes condensation of the water vapour in the warm air, forming at first cloud and later drizzle or continuous steady rain. The cloud spreads out ahead of the warm front, and the highest cloud, cirrus or mares' tails, is often about 500 miles ahead. At the rear boundary of the warm sector, known as the "cold front," the cold air is pushing under the warm air forcing the latter to ascend rapidly; this process is sometimes violent enough to produce squalls. The rapid ascent of the warm air causes the moisture to condense in the form of cumulo-nimbus clouds (shower clouds), from which heavy showers may fall. The cold front gradually overtakes the warm front so that the warm sector is eventually lifted up from the earth's surface. When this has occurred the low is said to be occluded, and the warm and cold fronts have merged into the third type of front known as an " occlusion " (see Figs. 4a and b, and 5a and b). When a low has become occluded, it usually decreases in intensity and rate of travel, and gradually fills up. On the other hand, a low which has a marked warm sector is likely to be deepening, the winds associated with it may increase in force and its rate of travel may increase. Lows are usually travelling in a direction approximately parallel to the isobars (and in the direction of the wind) in the warm sector.

The approach of a low is indicated by a falling barometer. In the northern (southern) hemisphere, if the low is approaching from westward and passing northward (southward) of the ship, clouds appear on the western horizon, the wind shifts to a south-westerly (north-westerly) or southerly (northerly) direction and freshens, the cloud layer gradually lowers, and finally drizzle, rain or snow begins. If the low is not occluded, after a period of continuous rain or snow there is a veer (backing) of wind at the warm front, a rise of temperature and diminution or cessation of rain (or snow) in the warm sector, the visibility being usually moderate and the sky overcast with low cloud. The passage of the cold front is marked by the approach from westward of a thick bank of cloud (which however cannot often be seen because of the customary low overcast sky in the warm sector), a further veer (backing) of wind to west or north-west (south-west), sometimes with a sudden squall, rising pressure, a fall of temperature, squally showers of rain, hail or snow, and improved visibility (except during showers). The squally showery weather with a further veer (backing) of wind and drop in temperature may recur while the low recedes owing to the passage of another cold front or occlusion. If the low is occluded, the occlusion is preceded by the cloud of the warm front; there may be a period of continuous rain mainly in front of and at the line of occlusion, or a shorter period of heavy rain mainly behind the occlusion, according as the air in front of the occlusion is colder or warmer than that behind it. There may be a sudden veer (backing) of wind at the occlusion.

Often another low follows 12 to 24 hours later, in which event the barometer begins to fall again and the wind backs towards south-west (north-west), or even south (north).

If a low travelling eastward or north-eastward (south-eastward) is passing southward (northward) of the ship, the winds in front of it are easterly and they back (veer) through north-east (south-east) to north (south) or north-west (south-west); changes of direction are not likely to be so sudden as on the southern (northern) side of the low. In the rain area there is often a long period of continuous rain and unpleasant thick weather with low cloud. In winter in the colder regions the weather is cold and raw and precipitation is often in the form of snow.

Near the region of lowest pressure, lulls are sometimes experienced, but sudden changes are likely, and in a deep low the wind may increase in strength very rapidly, perhaps to gale force as the barometer begins to rise.

Sometimes in the air circulation of a large low, usually on the equatorial side and often on a cold front, a secondary depression develops, travelling in the same direction as the primary but usually more rapidly. The secondary often deepens while the original low decreases in intensity. In the region between the primary and the secondary depressions, the winds are not as a rule strong; but on the further side of the secondary, usually the southern (northern) side, winds are likely to be strong and they may reach gale force. Thus the development of a secondary may cause gales at a greater distance from the primary than anticipated, while there may be only light winds where gales were expected.

The above is a brief general description of lows and the associated weather in temperate or middle latitudes of the northern (southern) hemisphere. It must be emphasised, however, that individual lows in different localities differ considerably from one another, according to the characteristics (especially the temperature and humidity) of the air currents of which they are composed, and the nature of the surface over which they are travelling.

TROPICAL REVOLVING STORMS

This section comprises a general treatment of these storms, and the action recommended by ships menaced by them. The areas affected and the seasonal frequencies are only given in general terms. For detailed information regarding the areas affected reference should be made to the appropriate volume of the Admiralty Sailing Direction.

These storms are so named because the wind blows round an area of low pressure situated at the centre. The direction of rotation is anti-clockwise in the northern hemisphere and clockwise in the southern hemisphere. The wind does not revolve round the centre of the low pressure in concentric circles but has a spiral movement inwards, towards the centre.

A tropical storm is not so extensive as the depression of higher latitudes but, within 75 miles or so of the centre, the wind is often far more violent, and the high and confused seas near the centre may cause considerable damage to large and well-found ships, while small vessels (for example, destroyers) have foundered. The danger is still greater when ships are caught in restricted waters without adequate room to manœuvre. Due to torrential rain and sheets of almost continuous spray, visibility near the storm centre (but outside the " eye ") is almost nothing. Within 5 to 10 miles of the centre the wind is light or moderate and variable, the sky is clear or partially so, and there is a heavy, sometimes mountainous, confused swell; this area is known as the " eye " of the storm.

Every ship navigating in an area subject to tropical storms during the period of their occurrence, should be constantly on the alert for any sign of their approach, so that steps can be taken to avoid the danger zone while there is still time and sea-room.

Localites, season, and average frequency. Tropical storms occur for the most part on the western side of the oceans, though they are also experienced in the Bay of Bengal, off the north-west coast of Australia, and off the west coast of Central America. They are unknown in the South Atlantic. They are given various names according to the part of the World in which they occur.

Western North Atlantic	—hurricanes
Eastern North Pacific	
South Pacific	
Western North Pacific	—typhoons
Indian Ocean	—cyclones
Bay of Bengal	
Arabian sea	
North-west Australia	—willy-willies

They are most frequent during the late summer and early autumn of their hemisphere; they are comparatively rare in the southern hemisphere from mid-May to November, and in the northern hemisphere from mid-November to mid-June. In the Arabian sea, however, storms are most likely to occur at the change of the monsoon, *i.e.* October-November, and May-June, though they average only one or two a year. Out-of-season storms occur from time to time, particularly in the western North Pacific, where no month is entirely safe, and in the Indian ocean, where one is reported south of the Equator perhaps once in two years outside the usual season. The following table shows approximately the average number of severe tropical storms recorded in 10 years in the several areas.

West Indies	50
Western North Pacific . . .	250
„ South Pacific . . .	30
Southern Indian ocean . . .	60
Bay of Bengal	20
Arabian sea	10
Eastern North Pacific . . .	30
West Coast of Australia . .	10

Variations in any one year amounting to 50% above or below the average are not unusual. Some of the figures quoted may be an underestimate since in the less-frequented parts of the World some storms may have escaped detection.

Origin, movement and extent. Tropical storms originate as a general rule in the doldrums, between the parallels of 7° and 15° of latitude; those which affect the western part of the Pacific, South Indian and North Atlantic oceans are first reported in the western third of those oceans, though there are exceptions, such as in the North Atlantic during August and September, where an occasional storm is known to begin near the Arquipélago de C. Verde. In the northern hemisphere they move off in a direction between 275° and 350°, though most often within 30° of due west. When in a latitude of 25° or so they usually recurve away from the equator and, by the time they have reached the 30th parallel, the track (or path as it is more usually called) is north-easterly. In the southern hemisphere they move off in a WSW. to SSW. direction (usually the former), recurve at about 15° to 20° S., and thereafter adopt a south-easterly path. Many storms, however, do not recurve but continue in a west-north-westerly (or west-south-westerly) direction until they reach the mainland, where they quickly die.

The speed of these storms is usually about 10 knots in their early stages, increasing a little with latitude; it seldom exceeds 15 knots before recurving, but thereafter 20 to 25 is usual, though speeds of 40 knots or even more have been known.

Occasionally storms move erratically, the path turning towards the equator, or adopting an easterly component in a low latitude, or even making a complete loop, but on these occasions its speed is low, usually less than 10 knots, while the unusual path is being followed.

The extent of the storm area varies considerably with individual storms, but generally speaking, winds of force 7 or more are improbable at more than 200 miles (especially on the equatorial side of the storm area), and force 8 unlikely to be exceeded at more than 100 miles, from the storm centre, at a latitude of less than 20°. Thereafter the radius increases with latitude so that these distances are nearly doubled on reaching the 35th parallel, but the intensity diminishes near the centre. Hurricane force winds are likely within 75 miles of the storm centre in the tropics, and gusts exceeding 150 knots have been reported in a few instances within 50 miles or so (except in the eye of the storm).

Warning of existence or approach. In most instances, warning of the position, intensity and probable movement of a storm is given by radio at frequent intervals. (*See* Admiralty List of Radio Signals, Volume III.) Sometimes, however, there is insufficient evidence available for an accurate warning, or even a general warning, to be given, and ships must then be guided by their own observations. Of the following indications of the proximity of a tropical storm, the first is by far the most reliable within 20° or so of the equator; it should be borne in mind, however, that very little warning of the approach of an intense storm of unusually small diameter may be expected.

(a) If the corrected barometer reading is 3 mb. or more below the mean for the time of year, as shown in a climatic atlas, suspicion should be aroused and action taken to meet any development, such as raising steam in any available additional boilers, &c. It should be noted, however, that the barometer reading must be corrected not only for height, latitude, temperature and index error (if mercurial), but also for diurnal variation, the amount of which is given for each hour of the day in the Air Ministry climatic atlases. If the reading thus corrected is 5 mb. or more below normal, it is time to take avoiding action for there can be little doubt that a tropical storm is in the vicinity. According to an analysis of observations in the Western Pacific the centre of the storm is probably not more than 200 miles away. At this distance, at any rate in the China sea vicinity, the wind has usually increased to about force 6.

When proceeding through an area liable to be visited by these storms it is desirable to take hourly readings of the barometer.

(b) An appreciable change in the direction and/or strength of the wind.

(c) A swell is sometimes evident, proceeding from a direction that approximates to the bearing of the centre. If ahead of the storm this indication may be apparent before the barometer begins to fall.

(d) Extensive cirrus cloud followed, as the storm becomes closer, by much alto-stratus cloud and subsequently fracto-cumulus or " scud."

(e) In addition there is the warning that can be given by Radar. Certain sets can display on the screen areas where moderate and heavy rain is falling. The greatest range to which this can be done at present is about 80 miles. Although moderate or heavy rain does not fall symmetrically all round a storm, it is continuous for at least 50 miles in a broad sector extending from the " eye " of the storm where there is a circular area of relatively light winds and clear or partially clear sky. By the time this final, and quite unmistakable, evidence of the exact position of the storm is available, the ship is already in fairly high seas, and is probably experiencing winds of force 9 or 10. It should be in time, however, to enable her to avoid the centre, on the edge of which conditions are worst of all.

Note. In accordance with Article 35 of the International Convention for Safety of Life at sea it is the duty of every ship who suspects the presence or formation of a tropical revolving storm immediately to inform other vessels and shore authorities with all the means at her disposal. Weather reports should be made by radio at frequent intervals giving as much information as possible, especially corrected *(not* for diurnal variation as in *(a)* above) barometer readings. If barometer readings are uncorrected this fact should be stated in the signal.

Information required by the seaman before deciding upon action to be taken. To decide on the best course of action if a storm is suspected to be in the vicinity, a seaman requires to know:—

(a) the bearing of the centre of the storm;

(b) the path of the storm;

(c) the semicircle in which the ship is situated.

If an observer faces the wind, the centre of the storm will be from 9 to 11 points on his right-hand side in the northern hemisphere when the storm is about 200 miles away, *i.e.* when the barometer has fallen about 5 millibars and the wind has increased to force 6 or thereabouts; as a rule the nearer one is to the centre the more nearly does the angular displacement approach 8 points.

The path of the storm may be approximately determined by taking two such bearings with an interval of from two to three hours between observations, provided that allowance is made for the ship's movement. It can however be assumed that the storm is not travelling towards the equator; and, if in a lower latitude than 20°, its path is most unlikely to have an easterly component; and, on the rare occasions when neither of these statements applies, the storm is moving very slowly. (Exceptions to this are most likely in the South Pacific, where the occasional storms often move off on a course almost due south which develops an easterly component at a latitude of about 15°, and in the western North Pacific in the instance of some of the out-of-season storms which may recurve at an easly stage.)

The diagram (Fig. 6) headed " Typical Paths of Tropical Storms," on page 20, illustrates the terms " dangerous semicircle " and " navigable semicircle." The former lies on the side of the path towards the usual direction of recurvature, *i.e.* the right-hand semicircle in the northern and the left-hand semicircle in the southern hemisphere. It is so called because a sailing or low-powered ship caught in it may be blown towards the path along which the storm will pass, or the storm may recurve and the centre pass over her. The navigable semicircle is that which lies on the other side of the path. A ship situated within this semicircle will tend to be blown away from the storm centre, and the recurvature of the storm will increase her distance from the centre.

Practical rules for avoiding tropical storms. In whatever situation a ship may find herself, the matter of vital importance is to avoid passing within 50 miles or so of the centre of the storm; it is preferable to keep outside a radius of 200 miles or more, because at this distance the wind does not often exceed force 7 (and is generally not more than force 6), and freedom to manœuvre is maintained. If a ship has at least 20 knots at her disposal, and shapes a course that will take her most rapidly away from the storm before the wind has increased above the point at which her movement becomes restricted, it is seldom that she will come to any harm.

Sometimes a tropical storm moves so slowly that a vessel, if ahead of it, can easily outpace it or, if astern of it, can overtake it. Since, however, she is unlikely to feel seriously the effects of a storm so long as the barometer does not fall more than 5mb. (corrected for diurnal variation) below the normal, it is recommended that frequent readings should be made if the presence of a storm in the vicinity is suspected or known, and that the vessel should continue on her course until the barometer has fallen 5 mb., or the wind has increased to force 6 when the barometer has fallen at least 3 mb. If and when either of these events occurs, she should act as recommended in the following paragraphs, until the barometer has risen above the limit just given, and the wind has decreased below force 6. Should it be certain, however, that the vessel is behind the storm, or in the navigable semicircle, it will evidently be sufficient to alter course away from the centre.

In the northern hemisphere. (a) If the wind is veering, the ship must be in the dangerous semicircle. A steam or other power-driven vessel should proceed will all available speed with the wind 1 to 4 points (depending upon her speed) on the starboard bow. A sailing vessel should heave to on the starboard tack. Either type of ship should haul round to starboard as the wind veers, thereby tracing a course relative to the storm as shown by the pecked line in the diagram.

(b) If the wind remains steady in direction, or if it backs, so that the ship seems to be nearly in the path (it is sometimes difficult to determine satisfactorily if indeed the ship is nearly in the path, particularly if in the dangerous semicircle, because the wind does not always behave according to rule) or in the navigable semicircle respectively, a steam vessel should bring the wind well on the starboard quarter and proceed with all available speed. A sailing vessel should run with the wind on the starboard quarter. Either type of ship should alter course to port as the wind backs, thus tracing a course relative to the storm as shown by the pecked line in the diagram.

In the southern hemisphere. (a) If the wind is backing, the ship must be in the dangerous semicircle.—A steam or other power-driven vessel should proceed with all available speed with the wind 1 to 4 points (depending upon her speed and that usual for a storm in this latitude) on the port bow. A sailing vessel should heave to on the port tack. Either type of ship should haul round to port as the wind backs, thereby tracing a course relative to the storm as shown by the pecked line in the diagram.

(b) If the wind remains steady in direction, or if it veers, so that the ship seems to be nearly in the path (it is sometimes difficult to determine satisfactorily if indeed the ship is nearly in the path, particularly if in the dangerous semicircle, because the wind does not always behave according to rule) or in the navigable semicircle respectively, a steam vessel should bring the wind well on the port quarter and proceed will all available speed. A sailing vessel should run with the wind broad on the port quarter. Either type

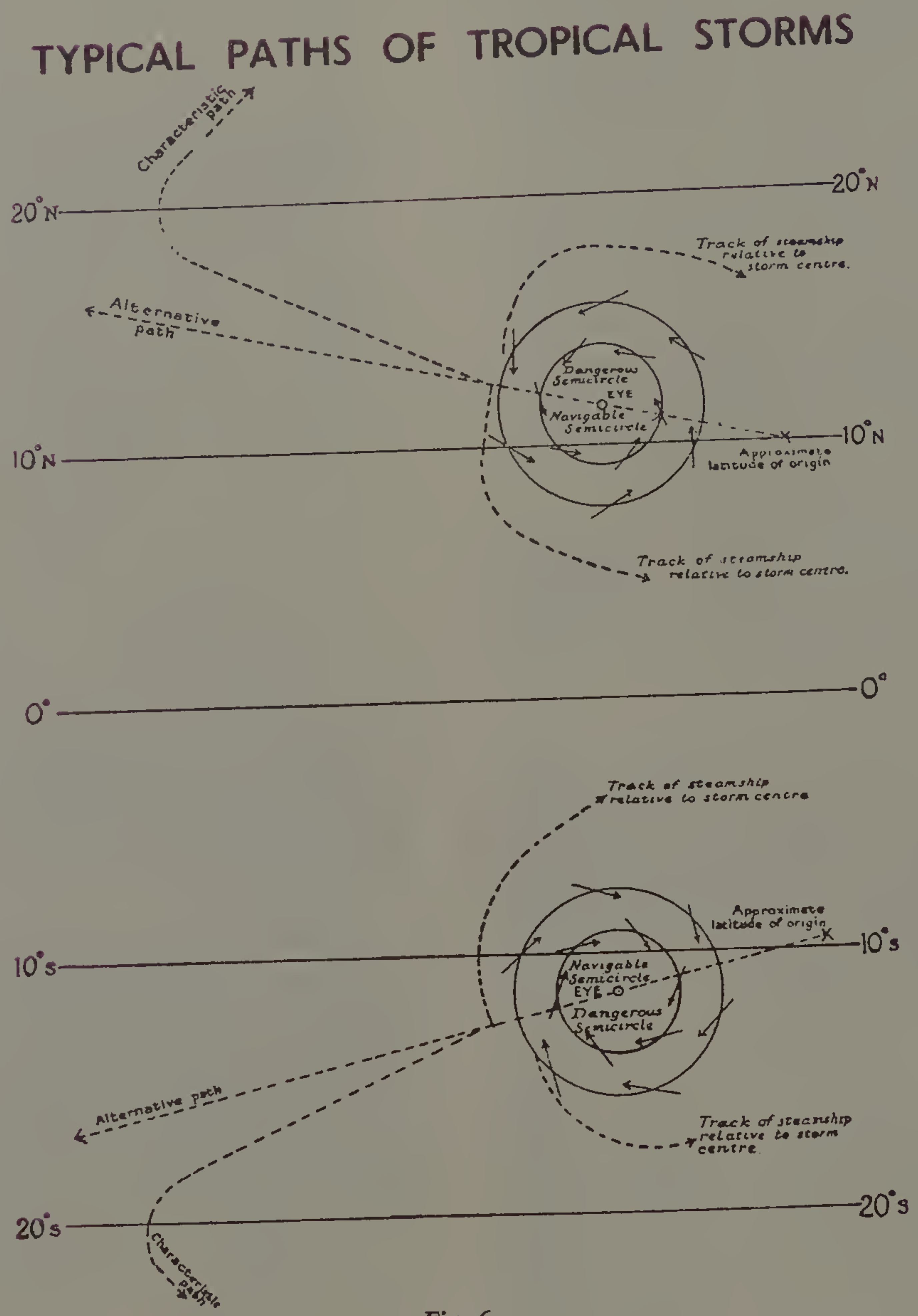
TYPICAL PATHS OF TROPICAL STORMS
Characteristic path
20°N
20°N
Track of steamship relative to storm centre.
Alternative path
Dangerous Semicircle
EYE
Navigable Semicircle
10°N
10°N
Approximate latitude of origin
Track of steamship relative to storm centre.
0°
0°
Track of steamship relative to storm centre
Approximate latitude of origin
10°s
10°s
Navigable Semicircle
EYE
Dangerous Semicircle
Alternative path
Track of steamship relative to storm centre
20°s
20°s
Characteristic path

Fig. 6.

TYPICAL PATHS OF TROPICAL STORMS

Note. In this diagram the isobars are shown as concentric circles about the eye; in practice this is usually the case within 150 miles or so of the centre. Outside this distance the isobaric form often loses its symmetry and strong winds often extend further on the polar side than on the equatorial.

of ship should alter course to starboard as the wind veers, thus tracing a course relative to the storm as shown by the pecked line in the diagram.

If there is insufficient room to run, when in the navigable semicircle, and it is not practicable to seek shelter, a vessel should heave to with the wind on the starboard bow in the northern hemisphere, and on the port bow in the southern hemisphere.

If in harbour, or at anchor, a seaman should be just as careful as at sea in watching the shifting of the wind and estimating the movement of the storm relative to himself, as by so doing he will be able to shift his berth with advantage or otherwise act according to circumstances. It is far preferable, however, to put to sea, if this can be done in sufficient time to avoid the worst of the storm. Riding out a tropical storm, the centre of which passes within 50 miles or so, in a harbour or anchorage, even if some shelter is offered, is an extremely unpleasant and hazardous experience, especially if there are other ships in company. Only if berthed alongside, or if special moorings and long bridles are used, can a ship feel secure.

Discretion must, of course, be used. In the case of a low-powered or small vessel with, for example, insufficient warning to enable her to gain sufficient distance from the storm by putting to sea, it will be preferable to remain in a reasonably sheltered harbour. If at sea and warning of an approaching storm is given and there is considered to be insufficient time or sea room to avoid the dangerous part of the storm area, it may be advisable for vessels of this type to seek shelter. In the China sea, for example, there are so-called typhoon harbours which are listed in the Admiralty Pilot. In all cases, however, the seaman must use seamanship and initiative.

ANTICYCLONES

In addition to the permanent and seasonal anticyclones mentioned above, there occur from time to time anticyclones (or highs) of a more temporary nature. Over the eastern sides of the oceans the movement of such a system is generally slow and erratic, and it may often remain almost stationary for several days. Consequently the weather is settled, *i.e.* it remains much the same for several days; the pressure gradient is usually slack and hence winds are light; weather is often fine with only small amounts of cloud and much sunshine, but this is not invariably so, especially in the winter months when gloomy overcast skies are common in anticyclonic weather. Precipitation is, however, rare except in the outskirts of the system.

Over the western parts of the oceans and in the Southern ocean, anticyclones are more likely to move quickly, and consequently the weather is more changeable. The movement is generally towards an Easterly point.

FOG

Fog is caused by the cooling of air in contact with the surface to a temperature at which it can no longer maintain, in an invisible state, the water vapour which is present in it. The condensation of the surplus vapour into minute, though visible, droplets constitutes fog, and it is upon the means by which the air is cooled that the type of fog depends. Climatic charts 5301 and 5302 show the chief areas in which fog occurs on a large scale at sea. For detailed information regarding specific localities reference should be made to the Admiralty Sailing Directions.

(*a*) Sea or Advection Fog

Sea or Advection Fog is associated with moist and relatively warm air flowing over a cold sea surface; it is responsible for some 85% of fogs experienced in the open sea. In general this type of fog is most common in the late spring and early summer, at which time sea temperature is at its lowest as compared with air temperature.

In order for fog to be produced by this means the rate of cooling of the air must be high, and this only occurs frequently and on a large scale *(i.e.* on more than about 7 days per month) in the vicinity of cold currents and at a season when the prevailing wind is such as frequently to transport warm moist air over this cold water—or where the sea temperature is appreciably lower than the air which frequently blows over it.

The chief examples of the former are the fogs which occur in the vicinity of Newfoundland, the coasts of S.W. Africa and California, and between northern Japan and the Aleutian islands, over the cold waters of the Labrador, Benguela, California, and Oya shio currents respectively; the latter type is represented by the spring and summer fogs of the China coast.

(*b*) Frontal Fog

This type of fog may occur in the vicinity of an occlusion or ahead of a warm front (see page 17) and is due to the evaporation of the warm raindrops into the cold air beneath the frontal surface, whereby the relative humidity of the latter is raised to saturation point. This type of fog therefore only occurs where the difference of temperature between the warm and the cold air is large. It occurs in temperate and high latitudes and is confined to a relatively narrow belt not usually more than about 50 miles in width.

(*c*) Arctic Sea Smoke

This type of fog is normally confined to high latitudes; it occurs when very cold air flows over a very much *warmer* sea surface. Under these conditions intense evaporation takes place from the relatively warm sea. The moisture thus evaporated is immediately chilled by contact with the cold air, and condensed to form fog, giving the sea the appearance of steaming. The formation of this type of fog necessitates the air temperature being at least 25°F. colder than that of the sea over which it is flowing. It is experienced in winter when offshore winds transport very cold air to seaward from over ice or snow covered ground, or close to the ice edge when a cold wind is blowing off the ice.

(*d*) Radiation Fog

Forms over low-lying land on quiet nights with clear, or nearly clear, skies. It is caused by the earth radiating its heat into space, becoming cooled, and thus chilling the air in contact with it to a temperature sufficiently low for condensation to take place in the form of fog. It therefore occurs mostly during the winter months (with their long nights), and is thickest during the latter part of the night or early part of the day. It may drift out to sea, but since the sea surface temperature is generally relatively high at this season, the water droplets soon evaporate; consequently this type of fog does not usually extend more than about 10 to 20 miles offshore.

ICE

The mean limits of ice during the months of greatest and least extent, viz.: March-April and August-September for pack ice, and May and October for icebergs are shown on Climatic Charts 5301 and 5302. More detailed information is given in the atlases of monthly ice charts of the Arctic seas and western North Atlantic published by the Marine Branch of the Meteorological Office, Air Ministry, and in a similar atlas of the North Pacific published by the Hydrographic Department, Admiralty. These should be consulted before undertaking passages through areas where ice is liable to be encountered. For similar information regarding the southern hemisphere reference should be made to Chart 1241. Detailed information on ice conditions in the several parts of the world affected is given in the appropriate volume of the Admiralty Sailing Directions. Considerable year-to-year variations in the limits of the ice occur due to temporary changes in the direction and speed of currents and prevailing winds, and to the occurrence of abnormally warm or cold seasons in high latitudes.

Indications of the proximity of ice

Pack ice. *(a)* Sea surface temperatures give some indication in darkness or low visibility of the proximity of ice. Since sea water freezes at a temperature of about 28½°F., and since persistent winds off the ice will cause it to extend temporarily to seaward and to become more open, while winds towards the ice will cause it to recede and become more tightly packed, a temperature of 34°F. should for safety be regarded as not more than 150 miles from the ice edge—or 100 miles if there is a persistent wind blowing off the ice. A sea temperature of 31°F. should generally be assumed to indicate that the nearest ice is not more than 50 miles away.

(b) Ice-blink—the reflection of ice on the lower clouds. This may appear as a diffuse white patch on visible cloud, or as brilliant scintillating strips on the horizon. There is no ice-blink on a sunny day with a clear sky.

(c) The absence of motion of the water in a fresh breeze is generally a sign of ice or land to windward.

(d) Fog often indicates the edge of the ice in spring or summer.

(e) In fog, white patches indicate the presence of ice at a short distance.

(f) In the Arctic, if far from the land, the appearance of walrus, seals and birds may indicate the proximity of ice. In the Antarctic, the Antarctic Petrel and Snow Petrel are said to indicate the proximity of ice—the former being found only within 400 miles of the ice edge, and the latter within only a few hours steaming of it.

(g) The appearance of isolated fragments of ice often points to the proximity of larger quantities.

Icebergs. *(a)* Sea temperature, although of little value in giving warning of individual bergs, should none the less be carefully watched since, at any rate in the N. Atlantic, it will indicate when the ship enters the cold ice-bearing currents.

(b) Ice-blink does not normally reveal the presence of bergs except in the case of some of the very large ones of Antarctic regions.

(c) In the case of large Antarctic bergs, the absence of sea in a fresh breeze indicates the presence of ice to windward if far from the land. In the Arctic however, and in many cases also in the Antarctic, the bergs are too small for this to be a reliable guide.

(d) In fog, a white patch indicates the presence of ice at a short distance.

(e) The noise made by the breaking of the sea against a berg, or by the ice cracking or pieces of it falling into the sea, may be audible at a short distance and give some warning.

(f) The appearance of isolated fragments of ice often points to the proximity of larger quantities.

Ice terminology. The definitions in use for the various types of ice are given in Admiralty Sailing Directions covering areas in which ice is prevalent.

Ice Warnings
International Ice Patrol } for details see Admiralty List of Radio Signals, Vol. II.

SECTION A

Chapter II

OCEAN CURRENTS

(See Diagram of Ocean Currents, Chart No. 5310, in pocket at the end of the book)

General remarks

Currents flow at all depths in the oceans, but in general the stronger currents occur in an upper layer which is shallow in comparison with the general depth of the oceans. Ocean current circulation therefore takes place in three dimensions. The navigator is only interested in the surface current circulation, which may be defined as the circulation at a depth of about half the ship's draught. This may differ slightly, especially in the case of a big ship, from that at the very surface, such as would affect a ship's boat and all drifting objects of negligible draught. A current at any depth in the ocean may have a vertical component, as well as a horizontal one; a surface current can only have horizontal components.

The main cause of surface currents in the open ocean is the direct action of the wind on the sea surface, and a close correlation accordingly exists between their directions and those of the prevailing winds. A wind of high constancy, blowing over great stretches of an ocean, will obviously have the greatest effect in producing current. Thus the north-east and south-east trade winds of the two hemispheres are the mainspring of the surface current circulation. In the Atlantic and Pacific oceans the two trade winds drive an immense body of water westwards over a width of some 50° of latitude, broken only by the narrow belt of east-going Equatorial Counter-current, which is found a few degrees north of the equator in both these oceans. A similar westward urge of water occurs in the South Indian ocean by the action of the south-east trade wind.

The main surface current circulations thus form great "closed" systems or eddies centred on the areas of permanent high pressure, with which the wind circulations are also associated, in approximately latitudes 30°N. and S. The direction of wind and current circulation is clockwise in the northern hemisphere and counter-clockwise in the southern hemisphere. There are also regions of current circulation outside the main eddies, due to various causes, but associated with them or dependent upon them. As an example, part of the North Atlantic current branches from the main system and flows past the north of Scotland and northward along the coast of Norway. Branching again, part flows past Spitsbergen into the Arctic ocean and part enters the Barents sea. Another associated circulation is that of the Mediterranean.

In the main monsoon regions, the north part of the Indian ocean and the extreme west of the North Pacific ocean (China seas and Eastern archipelago), the current reverses seasonally, flowing in accordance with the monsoon blowing at the time.

The South Atlantic, South Indian and South Pacific oceans are all open to the Southern ocean, and the Southern Ocean current, encircling the globe in a easterly direction, completes the southern part of the main circulation of each of these three oceans.

The general surface current circulation of the world is shown in Chart 5310 (in the pocket at the end of the book), on which the different circulations during the two monsoon seasons are indicated. Apart from these major changes of direction, there are some minor seasonal changes of position of currents, which cannot be shown on a single general chart. One of the chief of these is the Equatorial Counter-current of the North Atlantic ocean, which originates much further eastward in February to April, in about longitude 26°W. For details of the circulation, reference should be made to current atlases.

Over by far the greater part of all oceans, the individual currents experienced in a given region are variable, in many cases so variable that on different occasions currents may be observed to set in most, or all, directions. Even in the regions of more variable current there is often, however, a greater frequency of current setting towards one part of the compass, so that in the long run there is a flow of water out of the area in a direction which forms part of the general circulation. Some degree of variability, including occasional currents in the opposite direction to the usual flow, is to be found within the limits of the more constant currents, such as the great Equatorial currents, or the Gulf stream. The constancy of the more constant currents varies to some extent in different seasons and in different parts of the current. It is usually about 75% or more; it rarely exceeds 85% and then only in limited areas. Current variability is mainly due to the variation of wind in strength and direction. For the degree of variation to which currents are liable, reference should be made to the charts of current roses given in the atlases referred to below.

Current Atlases

The following atlases are published by the Marine Branch of the Meteorological Office:—

1. Quarterly Surface Current Charts of the Atlantic Ocean, M.O.466.
2. Indian Ocean Currents, M.O.392.
3. Quarterly Surface Current Charts of the Western North Pacific Ocean (westward of longtitude 160°W.), M.O.M.476.
4. South Pacific Ocean Currents, M.O.435.

Warm and Cold Currents

The common conception of currents as either warm or cold is not very satisfactory, and needs to be amplified. Currents may be classified as follows:—

(i) Currents, the temperature of which corresponds to the latitude in which they flow and in which the sea surface isotherms therefore run approximately east-west; this temperature may be warm, cold or intermediate.

(ii) Currents, the temperature of which does not correspond to the latitude in which they flow, and in which the sea surface isotherms trend more or less markedly northward or southward. They are therefore either warmer or colder than currents of class (i) flowing in the same latitudes.

Examples of class (i) are the warm west-going Equatorial currents of all oceans and the cold east-going Southern Ocean current encircling the globe. Examples of class (ii) are the warm Gulf stream and the warm Kuro shio, which transport the warm water of the Equatorial currents to higher latitudes, and the cold East Greenland current, transporting cold water from the Arctic basin to lower latitudes.

Currents of class (ii), cold relatively to their latitude, may be subdivided into two kinds, depending on the origin of the cold water.

(*a*) Currents bringing the cold water of polar regions to lower latitudes, such as the East Greenland current, the Labrador current, the Falkland current and the Oya shio. These currents do not form part of the main closed circulation round the high-pressure area in each ocean.

(*b*) Currents of lower latitudes, such as the Peru current, forming the eastern part of the main circulation. In these cases the relative coldness is caused by colder water rising to the surface from moderate subsurface depths, near an extended coastline. This process is known as upwelling, the reason for which is given later. The upwelling water is not as cold, on the scale of temperature, as that of the currents described under (*a*) above.

The warm currents, transporting warm water to higher latitudes, are found on the western sides of the main closed circulations in both hemispheres. These currents, and the colder ones on the eastern sides, can be tabulated as follows:—

	Warm current on Western Side of ocean	Cold current and area of upwelling on Eastern Side of ocean
N. Atlantic ocean	Gulf stream	Canary current
S. Atlantic ocean	Brazil current	Benguela current
N. Pacific ocean	Kuro shio	California current
S. Pacific ocean	East Australian coast current	Peru current
S. Indian ocean	Mozambique and Agulhas currents	

There is no upwelling on the eastern side of the South Indian ocean, where no extended coastline occurs. It should be noted that the relative warmth of the warm currents on the western sides of the ocean, compared with other water in the same latitude, is greatest in winter and least in summer.

Cold currents from high latitudes have a special significance for navigators by transporting ice to low latitudes. Cold currents also contribute to the occurrence of a high frequency of fog and poor visibility in certain regions, see page 21.

Strength of Currents

The information given below is generalised from the current atlases, and refers to the currents of the open ocean, mainly between latitudes 50°N. and 50°S. It does not refer to tidal streams, nor to the resultants of currents and tidal streams in coastal waters. Information as to current strength in higher latitudes is scanty.

The proportion of nil and very weak currents, less than a quarter of a knot, varies considerably in different parts of the oceans. In the central areas of the main closed oceanic circulations, where current is apt to be most variable, the weakness of the resultant, or vector, mean flow is, in general, not caused by an unduly high proportion of very weak currents, but by the variability of direction of the stronger currents. There is probably no region in any part of the open oceans where the currents experienced do not at times attain the rate of at least one knot.

Currents of between 2 and 3 knots are found mainly in the western part of the Equatorial currents, and in the warm currents of the western sides of the circulation in both hemispheres, with the exception of the Brazil current. They also occur in parts of the Equatorial Counter-currents and in the monsoon areas of the North Indian ocean and China seas. These regions are specified below:—

Atlantic ocean.
1. South Equatorial current, mainly west of long. 32°W., and its extension in the southern part of the Caribbean sea.
2. Gulf stream, from Florida strait to long. 40°W.
3. Guinea current (but not the Equatorial Counter-current as a whole).
4. At certain season in the extreme west of the Mediterranean, in the Falkland current and its extension, the Brazil Counter-current, and in the region of the Cape of Good Hope.
5. Only a very few observations of current exceeding 2 knots have been recorded elsewhere.

Indian ocean.
1. Equatorial current in the region of Madagascar.
2. Equatorial Counter-current.
3. Mozambique current and its extension, the Agulhas current.
4. East African Coast current in both monsoons, *i.e.* whether it is flowing northward or southward along the coast.
5. The South-west Monsoon current in the Arabian sea and Bay of Bengal.
6. The region immediately east and south of Ceylon, throughout the year.
7. Only a very few observations of current exceeding 2 knots have been recorded elsewhere.

North Pacific ocean.
1. Occasionally in the North Equatorial current, west of long. 152°E.
2. Equatorial Counter-current, west of 140°E, and eastward of Mindanao and in the Celebes sea, where the North Equatorial current is recurving southward into the Counter-current.
3. Kuro shio, from Luzon to about long. 150°E. (160°E. in March to May).
4. In the China seas, in both monsoon periods.
5. In the region of the Gulf of Panama, to long. 84°W, in November to July.
6. No observations of current exceeding 2 knots have been recorded elsewhere, but the North Pacific ocean eastward of long. 160°W. has not yet been charted.

South Pacific ocean.
1. South Equatorial current, mainly on the eastern side of the ocean.
2. East Australian Coast current.

Currents of over 3 knots are confined to very restricted regions. They have been recorded in the equatorial regions of the oceans, and in the warm currents flowing to higher latitudes on the western sides of the oceans, with the exception of the Brazil current. The regions are as follows:—

North Atlantic ocean.
1. South Equatorial current, between long. 34°W. and 70°W., except in February to April.
2. Gulf stream, Florida strait to long. 58°W., throughout the year.
3. Guinea current, May to July only.

Indian ocean.

1. East African Coast current, throughout the year, most frequent in May to July.
2. The region south of Socotra, June to November.
3. Mozambique and Agulhas currents, throughout the year, more frequently in the Agulhas current.
4. The region immediately east and south of Ceylon, June to December.
5. An occasional observation is reported in the Equatorial Counter-current and in the southern parts of the Arabian sea and Bay of Bengal.

North Pacific ocean.

1. Kuro shio, throughout the year.
2. Eastward of Mindanao, June to August.
3. Off the coast of Annam, August to December and in February.
4. Very occasionally, elsewhere in the China seas.

South Pacific ocean.

1. South Equatorial current, lat. 0° to 4°N., long. 92° to 110°W. in August to October.
2. East Australian Coast current, north of lat. 34°S., in October to April.

The strongest currents so far recorded, and the month in which each was observed, are given below.

Gulf stream, February, 136 miles per day.

Kuro shio, November, 133 miles per day.

East Australian Coast current, April, 96 miles per day.

Agulhas current, September, 121 miles per day.

East African Coast current, near the coast, September, 118 miles per day.

East African Coast current, in the area south of Socotra;
August, 144 miles per day;
September, 144 miles per day; but currents of as much as 168 miles per day have been experienced in the month of September.

The region south of Socotra, between latitudes 9°N. and 11°N., during the height of the south-west monsoon, is the area of strongest known current in the world.

The General Surface Circulation.

The idea of oceanic circulation needs some explanation. If a small definite area of the ocean be chosen and all currents observed within that area be plotted, it will be found that they are variable, in greater or lesser degree. Surface water thus flows into and out of the area in various directions. Providing that each individual current is not exactly balanced by one of the same strength in the opposite direction, which is never the case, there will be in the long run a resultant flow of water out of the area. This flow is found by taking the vector mean of all the currents, *i.e.* a mean which takes account of the direction of each current as well as its rate. The resultant flows out of this and every similar area into which the ocean may be divided, form the general circulation.

The general circulation never exists as a whole at any given time. In many regions the actual currents at one time would be in accordance with the circulation, particularly in the regions of more constant current, but the circulation would frequently be interrupted, even in these. In the regions of more variable current, the deviations from the direction of the general circulation would be numerous, and possibly whole stretches of the circulation would be found missing if we could obtain an instantaneous view of the water movements of a whole ocean. The reality of the general circulation, in the long run, has been proved by numerous cases of the drifts of ships, bottles, etc., over great distances.

The Direct Effect of Wind in Producing Currents.

The general relation between the directions of the main surface currents and those of the prevailing winds has already been mentioned. This relation is greatest in the open ocean; other factors have to be taken into account to explain the flow of the great coastal currents, which form the western and eastern sides of the main circulation.

Wind has a direct effect in producing current, resulting from its frictional drag on the sea surface. A current so formed is called a drift current. The effect of wind in producing current is not, however, limited to this direct action, as will be explained later. If we take both the direct and indirect effects of wind into account, wind is by far the most important agent in the production of the existing surface current circulation.

The drift currents which have most effect in producing the general circulation are those energised by the permanent and semi-permanent winds. Next in importance are the currents which, in the long run, flow as a result of a more or less predominant wind, such as the westerly winds of temperate latitudes. Currents brought into being by transitory winds are a very important factor in producing current variability. Such transitory wind drifts are sometimes of considerable strength, and their effect may be anything between a slight change and a complete reversal of the previous current direction. In regions where the current of the general circulation continues to run from some cause other than that of the local wind, the actual surface current experienced will be the resultant of this and the transitory wind current. The variability of current is thus in general greatest where the wind direction is most variable.

The direct effect of wind on the sea surface does not extend to any great depth in the ocean. The actual depth varies according to wind strength and the latitude of the place. For lats. 20° to 60°, and a range of wind strength from Beaufort force 3 to force 8, the depths of the shallow layer in which some movement occurs due to direct wind influence vary from about 20 to 130 fathoms (36^{m}6 to 237^{m}7).

The direction of a drift current at the actual sea surface, in the deep open ocean, is 45° to the right of the wind direction in the northern hemisphere and 45° to the left in the southern hemisphere. In water of less depth, the deflection, which is an effect of the earth's rotation, is less, and in very shallow water may be as little as a few degrees, especially if influenced by the configuration of neighbouring land.

As already stated, the angle between the current at the actual surface and the wind producing it is 45°, in deep water. Below the surface, in the shallow layer to which the wind influence extends, the angle between current and wind direction increases progressively with depth, and the rate of water movement decreases with depth. It can be computed that the total effect of the wind is to transport the whole of the shallow layer of water in which the wind influence occurs in a direction at right angles to that of the wind, to the right in the northern hemisphere and to the left in the southern hemisphere. This is of the greatest importance in connection with certain types of gradient currents *(see below)*.

Gradient Currents.

Currents are also produced, either at the surface or at any depth, when there is a gradient of pressure in the water. These are known as gradient currents. Such a gradient may result in two ways; (i), if the sea level is not quite horizontal, an actual slope of the surface existing; (ii), if masses of water of different densities lie adjacent to one another. Such density differences arise from differences of temperature or salinity, or more usually, of both. If such masses of water are adjacent at the sea surface, and if, as is usually the case, their temperatures differ, a slope of the sea surface is produced, the surface of the warmer water lying a little higher than that of the colder water.

When a slope exists, the gradient current is produced as follows. Water tends to run down the slope, but immediately it starts to do so, the effect of the earth's rotation comes into play and diverts it to a direction at right angles to the slope. Where a slope does not exist, the gradient current occurs as a flow of the heavier water under the lighter water, finally resulting in horizontal layers, with the lighter water on the top.

A gradient current may be flowing at the ocean surface at the same time as a surface drift current is being produced by wind. In such a case the actual current observed is the resultant of the two.

An interesting example of a gradient current due to temperature difference is found in the Arabian sea and Bay of Bengal during February to April. The North-East Monsoon is still blowing, though it has weakened. A clockwise current circulation round the coasts is established during this time. On the western sides of the Arabian sea and Bay of Bengal, the circulation therefore sets against the wind. This coastal circulation is due to the cooling of the water at the head of the Arabian sea and Bay of Bengal during November to January, when the strength of the North-East Monsoon is blowing off the land. This temperature difference sets up a slope, uphill towards the warmer water in the open sea to the southward, and so produces the clockwise current. Towards the time of the onset of the South-West Monsoon, this temperature is decreasing, but the South-West Monsoon sets in in time to preserve the current direction and to enhance its rate, as part of the normal South-West Monsoon circulation. Observations of ships clearly show the clockwise current in February to April.

Effect of Wind Blowing over a Coastline.

Slopes of the sea surface may be produced by wind. When a wind blows parallel to a coastline or obliquely over it, a slope of the sea surface near the coast occurs. The effect of a wind blowing obliquely over the coast to seaward is to drive water away from the coast, so that the sea level slopes down to the coast. The effect of a similar wind blowing obliquely towards the land is to bank water against the coast, so that the sea level slopes up to the coast. In either case a gradient current results. A wind more or less parallel to the coast is the most effective in creating these slopes, since the total water transport, in the layer in which wind influence occurs, being directed at 90° from the wind, is then directly on to the coast or directly away from it. Whether the water runs towards or away from the coast depends on; (i) which way the wind is blowing, up or down the coast; (ii) which hemisphere is being considered. For example, in the region of the Benguela current (southern hemisphere) the South-East Trade wind blows obliquely to seaward over the coastline, *i.e.* towards the north-westward. The total transport of water is 90° to the left of this, *i.e.* towards the south-westward and therefore water is driven away from the coast.

The coastal currents on the east side of the main circulation are produced in this way, by removal of water from the coastal regions under the influence of the trade winds. As has been shown, the gradient current runs at right angles to the slope. As the slope is at right angles to the trend of the coastline, the gradient current must always be parallel to the coastline. Taking the Benguela current as an example, the water tending to run down the slope is deviated 90° to the left and therefore the gradient current is somewhat to west of north, since this is the general trend of the coastline. The South-East Trade wind is tending also to produce at the actual sea surface a drift current directed 45° to left of north-west, *i.e.* west, and the actual current experienced by a ship will be the resultant of this and the gradient current, approximately north-west.

These coastal currents on the eastern sides of the oceans are associated with the chief regions of upwelling, since colder water rises from moderate subsurface depths to replace the water drawn away from the coastal region by the wind. The balance between the replacement of water by upwelling and its removal by the gradient current is such that the slope of the surface remains the same, so long as the wind direction and strength remains constant. The actual slope is extremely slight and quite unmeasurable by any means at our disposal. In general, it is less than one inch in a distance of 10 miles.

The Labrador current is an example of one which is produced by the banking of water against the coast by the northerly winds prevailing during a large part of the year. Water tends to run down the slope to seaward, and being diverted 90° to the right, the current follows the coast southward.

Other Indirect Effects of Wind in Producing Current. When a drift is set up by the wind, the direction of the surface current is 45° from that of the wind in the open ocean. We have, however, seen that the total transport of water by the wind, taking subsurface levels into account, is 90° from the wind direction. In the southern part of the main circulation of the North Atlantic ocean, for example, the North-East Trade wind is driving the surface water westward. It is also driving the subsurface water in a north-westerly direction, at right angles to the wind, and in lower latitudes, in a more northerly direction, since the trade wind there is more easterly. Thus there is a piling up of water in the central regions of the main circulation eddy. This in turn produces a gradient current which, tending to flow downhill to the south-east or south, is deflected 90° by the earth's rotation and so flows south-west or west, *i.e.* in nearly the same direction as the surface current directly produced by the wind. The drift current is therefore strengthened by a gradient current, due indirectly to the wind. Thus it appears that there is no such thing as a pure drift current.

The westward urge of water by the trade winds, which blow over a great extent of the oceans, also produces a slope of the water right across the ocean in low latitudes. This uphill slope to the westward is excessively slight; it has been computed to be rather less than 3 inches per 1000 miles. The water constantly carried westward by the great Equatorial currents thus accumulates on the western sides of the oceans. The Gulf of Mexico constitutes a *cul de sac* in which the water so piles up, and to a measurable extent. It has been found that the sea-level is 7½ inches higher at Cedar cays, on the Gulf coast of Florida, than it is at St. Augustine, on the Atlantic coast of Florida. This head of water is the main cause of the flow of the Gulf stream, starting through Florida strait, which is the only possible exit. The other warm currents, on the westward sides of the main circulation, are formed in a similar way by the accumulation of water against the coastlines, at any rate partially. In some cases, or at some seasons, the action of the wind flowing across the coastlines may enhance the current, in the manner previously described.

The Equatorial Counter-currents in each ocean flow eastward downhill. They are shallow in depth and are compensation currents. In the North Atlantic ocean, for example, the Gulf stream is unable to carry away all the accumulating water on the westward side of the oceans, so that some of it returns directly eastward.

The Mediterranean

The current circulation of the Mediterranean is produced as follows. The rate of evaporation from this sea is high, and the inflow of water from the rivers entering it is not sufficient to maintain the level of the sea. Water therefore flows in from the Atlantic, through the Strait of Gibraltar, to make good the deficiency. The effect of the earth's rotation is to tend to divert the east-going flow through the strait to the south. There can be no actual deflection because of the narrowness of the strait, but this tendency to turn to the south keeps the inflow current against the whole length of the African coast and explains why the circulation must be in a counter-clockwise direction. By evaporation, the surface water of the Mediterranean becomes more saline and consequently denser. It therefore sinks and this denser bottom water emerges over the sill which forms the shallow Strait of Gibraltar, at depths below the incoming water. Being a subsurface flow, this current, on emergence into the Atlantic, does not appear as part of the surface circulation. It has been calculated that the whole of the water of the Mediterranean is renewed in about 75 years.

General Summary

The causes which produce currents are thus seen to be very complex, and in general more than one cause is at work in giving rise to any part of the surface current circulation. Observations of current so far are not numerous enough to determine the details of the surface circulation in all parts of the ocean. Still less is known of the subsurface circulations, since the oceans are vast and the work of research expeditions is very limited in time and place. It is known that the greatest variations of temperature and salinity occur in middle and lower latitudes, relatively near the surface, within a layer varying in depth from about 270 to 550 fathoms ($493^{m}8$ to $1005^{m}8$). This layer includes the still shallower layer in which the direct influence of wind acts in impelling the water. The strongest currents are therefore confined to this layer. Below it the circulation at all depths, in the open ocean, is caused by density differences, and is relatively weak. The great coastal currents on the western sides of the ocean flow also in the deeper levels and perhaps nearly reach the bottom.

The main surface circulation of an ocean, though it forms a closed eddy, is not self-compensating. Examination of current charts makes it obvious that the same volume of water is not being transported in all parts of the eddy. There are strong and weak parts in all such circulations. Also there is some interchange between different oceans at the surface. Thus a large part of the South Equatorial current of the Atlantic passes into the North Atlantic ocean to join the North Equatorial current, and so contributes to the flow of the Gulf stream. There is no adequate compensation for this, if surface currents only be considered. There is therefore interchange between surface and subsurface water. The process of upwelling has been described; in other regions, notably in high latitudes, water sinks from the surface to the bottom. Deep currents, including those along the bottom of the oceans, also play their part in the process of compensation. Thus water sinking in certain places in high latitudes in the North Atlantic flows southward along the bottom, and subsequently enters the South Atlantic.

Much, though not necessarily all, of the day to day variability of surface current is due to wind variation. Seasonal variation of current is also largely due to seasonal wind changes. It is not yet known whether the average current varies over successive periods of years, though it is possible that such changes do occur. There is some evidence, for example that the flow of the Gulf stream was appreciably weaker in 1932-1939 than in 1910-1931.

Section B

STEAMSHIP ROUTES

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SECTION B

INTRODUCTORY REMARKS

This section, which deals with the steamship routes of the various oceans and seas, is divided into four parts as follows:—

Part I. Atlantic ocean.
Part II. Mediterranean and Black seas.
Part III. Red sea, Indian ocean and Persian gulf.
Part IV. Pacific ocean.

Each part is divided into chapters, of which the first describes the Winds and Weather, Currents, and Ice, and the remainder the Routes from, and to the principal ports of the ocean under consideration.

Chapter I. Winds and Weather, Currents, and Ice

Owing to the necessarily limited space available in a book of this nature, only a brief outline can be given of the Winds and Weather, Currents, and Ice conditions which predominate in the various oceans and seas of each part of this Section; Chapter I should be considered as amplifying the information in Section A. as regards the conditions prevailing in the area under review. For more precise information the mariner should consult the various volumes of the Admiralty Sailing Directions and the publications of the Air Ministry mentioned in Section A.

At the beginning of Chapter I of each Part there is printed an index giving, in consecutive order, the principal contents.

Remaining Chapters of each Part. Routes.

For convenient reference, each Chapter (2 to 4 in number) in each Part is designed to cover the routes from ports on one section of the coast, and/or island groups of the ocean concerned; furthermore, each chapter is sub-divided into a number of sub-sections each containing the routes from an individual country or port.

Purely coastal voyages are omitted, except where they form part of an ocean passage *(e.g.*, on the voyage between the English channel and Rio de La Plata, in which the passage along the east coast of South America is included), or in such cases as voyages North and South along the western coast of America; or again the passages through the channels between the islands of the Eastern archipelago connecting the Indian and Pacific oceans.

The method adopted has been to take each principal port in turn, and to give from it the routes to all the other principal ports of the ocean in which it is situated. The ports of departure have been taken in geographical sequence along each side of the ocean to which they belong, either from North to South, from East to West, or as most convenient. For example, in the case of the Indian ocean, the following order has been taken: first, routes through the Red sea; next, routes from ports on the western side of the ocean, from North to South, viz., from Aden to Cape Town, including Mauritius and Seychelles; next, from ports along the northern side of the ocean, from West to East, viz., from the Persian gulf to Calcutta; and, lastly, from ports along the eastern side of the ocean, from North to South, viz., from Rangoon to Hobart.

Routes from island ports, such as Las Palmas (Puerto de la Luz), Mauritius, Suva, have also been included, according to ocean.

Routes are not given from a port of one ocean to a port of another in a single voyage *(but see Note below)*. If, for example, it was desired to proceed from the English channel to New Zealand, around the Cape of Good Hope, without breaking the voyage, it would be necessary to combine the two routes, " Bishop rock to Cape Town " (Route 48), in the Atlantic ocean, with " Cape Town to New Zealand " (Route 350), in the Indian ocean. It is presumed that most steam-vessels would wish to break a voyage from one ocean to another for fuel, etc.; and the arrangement of routes in this book is based on these lines.

Note.—In the following three cases, where there is a choice not only of proceeding eastward or westward, but northward or southward of South America or Africa, through routes are given from Australia and New Zealand to Bishop rock. The reverse route is not given from Bishop rock, as the object was only to compare the distance to be covered by each route.

Route 526.—Sydney to Bishop rock.
Route 556.—Brisbane to Bishop rock.
Route 596.—Wellington to Bishop rock.

All three passages may be made either eastward via the Panama canal or via Estrecho de Magallanes (Magellan strait), or westward via Aden and the Red and Mediterranean seas or via the Cape of Good Hope.

All the routes are numbered consecutively throughout the whole book, from the beginning of the steamship routes to the end of the sailing-ship routes, irrespective of oceans or of chapters. By this means, inter-reference between routes can easily be made. This is constantly necessary, as, for example, where a navigational caution as to fog, etc., or the same route, for part of its distance, is common to two or more different voyages; or where the return voyage is along the same track as the outward. Spare numbers have been left at intervals throughout the book, in order to provide for future additions if required.

Although all the routes are numbered consecutively, as stated above, the fact that there are, in many cases seasonal and alternative routes as well as those for low-powered vessels, has made the sub-division of the main route necessary; such sub-divisions are indicated by small letters (a), (b) (c), etc.) in brackets. In the event of an alternative, seasonal, or low-powered route needing further sub-division, the numbers (i), (ii), (iii), etc. are used. Examples of the method of numbering routes will be found in Route 508, Sydney to Manila or Route 509, Sydney to Singapore.

In some cases where the title of the route is in general terms *(e.g.* Route 520, Sydney to ports in British Columbia), or to two or more named destinations *(e.g.* Route 503, Sydney to Fiji, Samoa, or Tonga islands), and the routes to individual ports or islands are described under separate sub-heads, they will be numbered (1), (2), (3), etc.; these again may be sub-divided into (a), (b), etc., and (a) (i), (a) (ii), etc., (b) (i), (b) (ii), etc., as described above.

The route directions have been made as brief as possible, consistent with clearness. Navigational Notes from various sources have been included where possible, and, besides these, reference is made to the published Admiralty Sailing Directions and pilots in cases where a track passes along a coast or amongst islands, reefs, and other dangers. *See also* Section D.

Cautions respecting ice, fogs, fishing vessels, etc., are entered in the same manner, either directly in the text or by reference to Admiralty charts and other publications.

Distances

These are provided for every steam-ship route; they have been taken from the Admiralty Distance Tables in cases where the shortest navigable track between ports is that recommended to be followed. The Distance Tables have been employed also in cases where a general indication of distance between ports was necessary.

In routes which combined Great Circle with Rhumb line tracks, or in which divergencies from the shortest line were desirable, special calculations of distance have been made.

Route charts.

In the pocket at the end of the book will be found charts (5,305, 5,306 and 5,307) of each of the three oceans, Atlantic, Indian, and Pacific, on which are laid down the tracks of many of the routes described in this book, with their distances and other appropriate information. It was not possible, without confusion, to protract on these charts every route, and only the principal ones are shown.

The charts are to be regarded as supplemental to the information given in the text. They illustrate the tracks, and particularly the Great Circle tracks which, in the interests of time and fuel economy, it is desirable to take when making an ocean passage. In this connection the Admiralty gnomonic charts of the various oceans, prepared for the ready protraction of Great Circle tracks, are recommended to the navigator. *See* page 7.

Indexes

The following indexes contain information relative to Section B.

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Route index. See Introductory remarks 177–218

Winds and Weather, Currents, Ice

To be found at the beginning of Chapter I of each Part. *See* also Section A.

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PART I ATLANTIC OCEAN

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SECTION B. PART I

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WINDS AND WEATHER

GENERAL REMARKS

The following description of the winds and weather of the Atlantic ocean amplifies the general statement given in Section A. For more precise information regarding oceanic winds and weather the mariner is referred to the atlas of Monthly Meteorological Charts of the Atlantic Ocean (M.O.M. 402 and 402a) published by the Marine Branch of the Meteorological Office, Air Ministry. Detailed information relating to specific localities should be sought in the appropriate volumes of the Admiralty Sailing Directions.

In reading the following description reference should be made to the World Climatic Charts 5301 and 5302 which will be found in the pocket at the end of this book.

NORTH ATLANTIC OCEAN

The Doldrums

This belt of calms and light variable winds interspersed with squalls, heavy showers and thunderstorms, and situated between the trade winds of the two hemispheres is peculiar in the Atlantic ocean in that it remains north of the equator throughout the year. Its mean position in February and August, in which months it attains its extreme southerly and northerly positions respectively, is indicated on the world climatic charts 5301 and 5302. The actual position is, however, subject to considerable day to day variation, as also is the width of the zone; the latter averages about 200 to 300 miles, but it may at times be reduced to almost nothing by a strong burst of one or both of the trade winds.

There is evidence to show that the showers, squalls, and thunderstorms are more common within 200 to 300 miles of the African coast than in the western parts of the ocean.

Visibility in this zone is invariably good except when reduced by heavy rain.

The South-West Monsoon

In the northern summer, the intense heating of the great land mass of northern Africa gives rise to a lowering of pressure over that area, and the consequent distortion of the equatorial trough of low pressure, in which is situated the doldrums, towards the north (see climatic chart 5302). The South-East trade wind is drawn across the equator, is deflected to the right by the effect of the earth's rotation, and is felt on the west coast of Africa between the equator and about latitude 10°N. and in the adjacent ocean east of about longitude 20°W. as a south-west wind known as the South-West Monsoon (see chart 5302). The season of these south-westerlies is from about June to mid-October and they are accompanied by cloudy weather and considerable rainfall the latter being heavy on the coast between Gambia and Liberia. Visibility is good at this season except when reduced by rain.

During the remaining months winds in this area are mainly northerly in the north, but are mostly from between south and west in the Gulf of Guinea; in both cases they are generally light. Between November and February a dry, dust-laden easterly wind, known as the " Harmattan " occurs at times. Weather at this season is generally fine but visibility is often only moderate due to haze, and it may become poor during periods when the Harmattan is blowing.

Towards the beginning and end of the rainy season, that is in April, May, October and November, violent thunderstorms accompanied by severe squalls generally from an easterly direction occur at times in the vicinity of the coast. These are known locally as " Tornadoes " but they should not be confused with the storms of similar name which occur in the interior of the United States and Australia, and to which they bear no relation.

North-East Trade Winds

These winds form the equatorial side of the great clockwise circulation around the oceanic high pressure area or anticyclone situated in about latitude 30°N. and towards the eastern side of the ocean. The area covered by these winds is best seen from a study of the climatic charts, from which it will be observed that the general direction of these winds is from about N.N.E. on the eastern side of the ocean, and from nearly East in the western part of the zone. These winds blow permanently, and with little variation in direction, throughout the year; their average strength is Beaufort force 4, though at times they may freshen to force 5-6 and on rare occasions force 7, and at others lull to force 2. The trade winds extend into the Caribbean sea and Gulf of Mexico, though in the latter region they are much more variable both in direction and strength, and from November to March are sometimes interrupted by strong or gale force northerly winds known as " Northers."

In the north-eastern part of the zone of the trades weather is generally fair or fine with small amounts of detached cumulus clouds and little or no rain. Cloud amount, and the liability to showers increases towards the doldrums; it also increases towards the west, where rain falls comparatively frequently, being a maximum in the summer months.

Haze is rather prevalent in the eastern part of the trades due to dust or sand being carried to seaward from the arid African coast by the prevailing offshore winds. Sea fog also forms at times in the north-eastern part of the zone over the cold waters of the Canary current. In the western part of the zone visibility is good except when reduced by rain.

The Variables (Horse Latitudes)

Extending across most of the ocean in about latitude 30°N., but oscillating from about latitude 28°N. in winter to about latitude 32°N. in summer, there exists a belt of generally light and variable winds in the vicinity of the oceanic " highs." East of about longitude 20°W. in winter and longitude 30°W. in summer however winds are predominantly from between north and north-east, and form in fact an extentsion of the North-East Trades; they are especially prominent in the summer months. In the western part of this zone winds are most often from some southerly point in the summer but are only light.

Weather in the eastern part of the zone is fine with only small amounts of cloud, and rain is very rare; in the western parts cloud amounts are larger an rain fairly common.

Visibility is often reduced by haze, and sometimes by fog, in the eastern parts of the area for reasons explained in the section on the North-East Trade wind.

The Westerlies

On the polar side of the oceanic " high " the prevailing winds are from some westerly point. The almost continuous passage of depressions or "lows" (*see* Section A.) across this zone in an easterly or north-easterly direction towards Iceland, northern Norway or the British Isles, however, causes the wind to vary greatly both in direction and strength, and winds from any direction may be experienced. The usually steep pressure gradient associated with these "lows" causes a high frequency of strong winds; gales are common—especially in the winter months as is indicated by the buff-tinted areas on climatic charts 5301 and 5302. The region of highest gale frequency extends approximately from the vicinity of Newfoundland to about latitude 58°N. longitude 13°W. and in this region winds reach Beaufort force 7 or above on 16-20 days per month in January and February; in July, which is the quietest month, the stormiest area remains to the south-west of Iceland, but the frequency of winds of Beaufort force 7 or above is only about 7 days per month here. In the immediate vicinity of the coasts of Greenland, Iceland and Norway, Katabatic winds, which are described in Section A, are common.

The main feature of the weather in this area is its variability, periods of overcast skies and rain (or snow in the winter in the more northerly and westerly parts) alternating with fairer intervals. Fine weather is, however, seldom prolonged—especially in the winter —and cloud amounts are generally large.

In the western part of this zone in the vicinity of the coasts of New England, Nova Scotia and the Newfoundland banks, fog is very prevalent in the late spring and summer, and is due to the frequent winds from south or south-west transporting warm moist air over the cold waters of the Labrador current (see climatic chart 5302); over a large part of this area in the vicinity of the Newfoundland banks fog is experienced on over 10 days per month. It is also liable to occur at times in other parts of this zone—usually in spring and early summer and in association with winds from between south and south-west. Visibility is generally good with northwesterly winds.

The Polar regions

The greater part of the region lying on the polar side of the westerlies is unnavigable on account of ice, and need not therefore be dealt with in much detail. As will be seen from the climatic charts, the prevailing wind is from some easterly point though, as in the case of the westerlies, great variations both in direction and strength occur due to the passage of "lows" across the area. Gales are common, though less so than in the westerlies.

Weather is generally very cloudy and precipitation, usually in the form of snow, may occur in any month.

Fog, often of the Arctic Sea Smoke type (*See* Section A), is very prevalent in the summer.

In recent years attempts have been made to exploit what has come to be known as the " Northern Sea Route " from North Russian ports north-about to eastern Asia. The route is only practicable in August and September, and even then the constant attendance of icebreakers is necessary. The shortness of the navigation season, the ice difficulties and the very high fog frequency makes it improbable that this route will ever become commercially profitable.

Tropical storms (Hurricanes)

These destructive storms, which have been described in Section A, occur in the western half of the ocean, and affect in particular the Caribbean, Gulf of Mexico, Florida, the Bahamas and Bermuda together with the adjacent ocean areas. They occur from June to October and occasionally November, the month of greatest frequency being September.

More detailed information regarding storm frequencies in specific localities will be found in the Admiralty Sailing Directions. Precursory signs of the presence of these storms and the action recommended to ships in order to avoid them is given in Section A.

SOUTH ATLANTIC OCEAN

General remarks

The wind regime in the South Atlantic is very similar to that of the North Atlantic except that the circulation around the oceanic anticyclone is in an anti-clockwise direction. Other points of difference are the absence of winds corresponding to the South-West Monsoon of West Africa, of Tropical Storms and of the Doldrums.

The South-East Trade Winds

As in the case of the North-East Trades of the North Atlantic these winds form the equatorial side of the anticyclonic circulation around the oceanic high pressure area, and situated in this ocean in about latitude 28°–20°S. They blow with equal persistence and lack of variation in their direction, the latter being about South-South-East on the eastern side of the ocean and nearly east in the western part. Due to the Doldrums never penetrating south of the equator these winds blow right up to the line in the winter (July) and to within two or three degrees of it in summer (January). The average strength of the South-East Trade is similar to that of its counterpart in the North Atlantic except north of about latitude 10°S. to east of about longitude 10°W., where it is considerably lighter, and only averages Beaufort force 2-3.

Weather is similar to that described for the zone of the North-East Trades, except fog is very prevalent over the cold waters of the Benguela current close to the coast of S.W. Africa between about latitude 20°S. and 30°S.

The Variables

Here again conditions are similar to those found in the corresponding zone of the north Atlantic. East of about the prime meridian winds are predominantly from between south and east-south-east, being in fact an extension of the South-East Trade. In the western part of the zone north-easterlies are commonest—especially in the summer.

The Westerlies (Roaring Forties)

South of about latitude 35°S. westerly winds predominate. As in the North Atlantic, the almost continuous passage of "lows" from a westerly towards an easterly point, causes the wind to vary greatly both in direction and strength, and winds from any direction can be experienced; the centres of the "lows" generally move from the vicinity of Cabo de Hornos in the direction of South Georgia and thence along about the 50th parallel. Gales are very prevalent; south of about latitude 40° S. even at midsummer winds reach force 7 or more on 7 to 9 days per month, and south of about the 43rd parallel and east of about longtitude 40°W. the frequency rises to about 15 days per month. In the winter this latter frequency is general south of a line joining the Falkland Islands and the Cape of Good Hope, while the major part of the area lying between this line and the 30th parallel has 5–10 days with winds of this force.

Weather is of a similarly variable nature to that experienced in the corresponding zone in the northern hemisphere.

Fog is not uncommon in the summer months and is generally associated with winds from some northerly point.

CURRENTS

NORTH ATLANTIC OCEAN

The Main Circulation

The main surface circulation of the North Atlantic ocean is clockwise. The southern part of this circulation consists of a wide belt of west-going current, comprising the more constant *North Equatorial current*, southward of about lat. 20°N., and the less constant *North Sub-tropical current*, between about lats. 20°N. and 32°N. Eastward of the Caribbean sea, the North Equatorial current is joined by the bulk of the corresponding South Equatorial current of the South Atlantic ocean, which flows past the north coast of Brazil. The combined Equatorial current flows westward through the Caribbean sea and emerges through Yucatan channel. It thence flows north-eastward along the northwest coast of Cuba and into Florida strait, to form the commencement of the Gulf stream, which constitutes the western side of the circulation.

The North Sub-tropical current, also continuing westward, passes into, or turns north and runs parallel to, the seaward edge of the Gulf stream *(see* below), in all latitudes from the north coast of Cuba to about lat. 32°N. That part of the general westerly current which passes through the Bahamas is sometimes referred to as the *Bahama or Antilles current.*

In a narrow belt northward of the equator, the *Equatorial Counter-current* flows eastward, between the North Equatorial current of the North Atlantic and the South Equatorial current of the South Atlantic. *(See page* 38*)*. The longitude of origin of this counter-current varies, being about 52°W. in August to October, and 18°W. to 26°W. in February to April. The counter-current flows past Cape Palmas and sets along the coast of the Gulf of Guinea to the Bight of Biafra; this extension is known as the *Guinea current.* The subsequent course of the water of the Guinea current is not fully known; the bulk of it probably recurves westward and flows into the South Equatorial current.

The flow of the warm waters of the *Gulf stream* between Florida strait and Cape Hatteras, follows the course of the 100-fathom (182^{m}9) line, along which its axis of greatest strength lies. Immediately north of Cape Hatteras the Gulf stream begins to leave the 100-fathom line and gradually turns eastward into the ocean, southward of the Georges and Nova Scotian banks. The inner edge of the Gulf stream, south of Cape Hatteras, thus gradually becomes the northern edge, northward and eastward of that cape. This northern edge is relatively sharply defined at all times of the year, owing to the convergence along it of the cold water of the *Labrador current.*

Eastward of about the 46th meridian, the Gulf stream ceases to be a well-defined current. It widens and weakens by fanning out up the east side of the Great Bank of Newfoundland. The resulting wide north-easterly and easterly flow is directed across the ocean towards the British Isles and the adjacent European coasts; this is known as the *North Atlantic current.*

The southerly part of the North Atlantic current turns gradually clockwise to south-easterly and then south-westerly directions, over the whole ocean eastward of the 40th or 45th meridians. It thus passes into the North Sub-tropical current to complete the main circulation. This widely-extended trend of the water, branching southward from the North Atlantic current, is called the *Azores current*, and occupies the belt of latitude between approximately the 42nd and 32nd parallels. The current known as the *Portugal current*, flowing southward off the west coasts of Spain and Portugal, and as the *Canary current* further southward, forms the coastal fringe of the general southerly flow of the Azores current. The Canary current passes into the North Equatorial current between the latitudes of Cap Blanc and Cap Vert (Verde).

Northward extension of the Main Circulation.—The more northerly part of the North Atlantic current does not recurve southward but continues to flow in a general north-easterly direction, off the west coasts of the Hebrides and the Shetland islands and thence to the coast of Norway. It sets northward up this coast, off which it is known as the *Norwegian Atlantic current.* In about lat. 69°N. the Norwegian Atlantic current divides and the left branch, called the *West Spitsbergen current*, sets northward to the west coast of Spitsbergen and thence into the Arctic basin. The right branch is called the *North Cape current* and follows the coast past Nordkapp (North cape) into the Barents sea, finally setting towards the north of Novaya Zemyla; a branch of it continues along the Murman coast and is called the *Murman Coast current.*

The chief outflow of water from the Arctic basin is the cold, ice-bearing current setting south-westward along the east coast of Greenland, known as the *East Greenland current.* A part of the East Greenland current diverges south-eastward from the main body of the current, northward of lat. 70°N. This current, the *East Iceland current*, passes the north-east coast of Iceland, and north of the Færoe islands, the set gradually trending eastward and finally north-eastward. It joins, or runs parallel to, the outer edge of the Norwegian Atlantic current.

A branch of the warm North Atlantic current turns northward in the longitude of Iceland. Closely south-westward of Iceland this current, known as the *Irminger current*, divides. The main branch turns westward and passes into the East Greenland current south of Denmark strait. A smaller branch makes a clockwise circulation of Iceland.

The East Greenland current rounds Cape Farewell and passes northwards along the West Greenland coast, where it is called the *West Greenland current.* This loses volume by fanning out on its seaward side, but a part of it circuits the head of Baffin bay, and, reinforced by water flowing eastward through Jones and Lancaster sounds, sets southward along the coast of Baffin island as the *Baffin Land current*. Northward of Hudson strait this is joined by a considerable branch from the West Greenland current which crosses Davis strait. The combined current known as the *Labrador current*, sets past the entrance to Hudson strait and south-eastward along the Labrador coast to the Newfoundland region.

After passing Belle Isle strait and the east coast of Newfoundland, the Labrador current covers the whole of the Great Bank, with the exception, during the summer months, of the extreme southern part. A large branch of the current follows the eastern edge of the Bank, this being the part which bears ice furthest south to reach the transatlantic steamship tracks. Another branch rounds Cape Race, and sets in a south-westerly direction. The bulk of the water on the bank also sets in this direction, so that the Labrador current fills the region between the south coast of Newfoundland, the south-east coast of Nova Scotia and the northern edge of the Gulf stream. The Labrador current continues southward along the United States coast, preserving its character as a cold current. Its greatest southern extension is to about lat. 36°N., closely north of Cape Hatteras, in November to January; its least extention is to about lat. 40°N. in August to October. The Labrador current and the Gulf stream converge along the northern edge of the latter.

Associated regions outside the Main Circulation

North sea and English channel.—This region is one of tidal streams, combined with variable currents depending on the wind blowing at the time or lately prevailing. After subtraction of the tidal streams, there is in the long run a weak current circulation as follows. A branch of the North Atlantic current leaves that current north-eastward of the Shetland Isles and flows southward following the east coasts of Scotland and England, finally reaching the neighbourhood of the Thames estuary, where it recurves. It is there joined by a branch of the North Atlantic current which passes up the English channel and through the Strait of Dover. The combined current flows along the Belgian and Netherlands coasts and the west coast of Jutland. It then flows round the Skaggerak in a counter-clockwise direction and after passing Lindesnes sets up the west coast of Norway.

Only a small part of the south-going water on the western side of the North sea reaches as far south as the Thames estuary, as water is fanning out eastwards from this southerly current all along its length. The bulk of this water, after crossing the North sea enters the Skaggerak on its southern side and so continues in the main circulation.

The *Norwegian Coastal current* flowing northward up the west coast of Norway is probably the most constant part of the circulation. It is the outflow from the North sea. In about lat. 62°N. this current rejoins the main branch of the North Atlantic current, the combined current flowing northward towards Nordkapp, as previously stated.

Bay of Biscay. Off the mouth of the Bay of Biscay the current is trending south-eastwards and southwards to form the beginning of the Portugal current (*see* page 37). A branch enters the Bay and recurves westward along the north coast of Spain to rejoin the southerly current in the region of Cabo Finisterre.

Gulf of Mexico. Part of the water passing through Yucatan channel turns westward and follows the coast of the gulf in a counter-clockwise direction; this finally enters the Gulf stream between Cuba and Florida. Another branch sets northward across the middle of the gulf to the region of the Mississippi delta, where it turns eastward and joins the coastal current. The *Caribbean Counter-current* sets eastward along the coasts of Panama and Colombia to the Rio Magdalena and beyond, throughout the year. It is strongest in August to October.

Mediterranean.—See Part II.

Black sea.—See Part II.

SOUTH ATLANTIC OCEAN

Main circulation.

The main surface circulation of this ocean is counter-clockwise. The *South Equatorial current* of the Atlantic ocean extends to about latitude 4°N. Southward of this it flows as a large body of water westward across the ocean. South of about lat. 6°S., there is a considerable reduction in the average strength of the current, though the general westerly direction remains. In the region between about lats. 6°S. and 22°S. this weaker and less constant westerly current is known as the *South Sub-tropical current.*

The eastern side of the circulation is formed by the relatively cool *Benguela* (or *South African*) *current*, which flows in a north-westerly direction from the region of Cape Town and passes into the South Equatorial current. It is analogous to the Canary current of the North Atlantic ocean. From about lat. 30°S., water from the Benguela current fans out in west-north-westerly and westerly directions on its seaward side. Northward of lat. 22°S., this water passes into the South Sub-tropical current.

While the whole, or nearly the whole, of the South Equatorial current flows along the north coast of Brazil into the northern hemisphere to join the North Equatorial current, the whole of the South Sub-tropical current is directed towards the coast of Brazil, southward of Cabo de S. Roque. A small part of this, turning northward along that coast, passes round Cabo de S. Roque and joins the South Equatorial current. The bulk of it continues southward along the coast of Brazil. This warm current is known as the *Brazil current*, and forms the western side of the circulation of the South Atlantic ocean.

The *Southern Ocean current* flows all round the globe southward of the South Atlantic, South Indian and South Pacific oceans, and forms the completion, on the southern side, of the anti-clockwise circulation in each of these oceans. The Southern Ocean current is restricted in width by passing through Drake passage, between Cabo de Hornos and Graham land. Eastward of this passage, it becomes very wide, its northern part fanning out north-eastward past the southern and eastern coasts of the Falkland islands, to reach to about the 34th parallel in the central longitudes of the South Atlantic ocean.

Further northward, the normal completion of the main circulation on its southern side is also to some extent effected by the recurving south-eastward and eastward of water from the seaward side of the *Brazil current*, mainly between lats. 28°S. and 42°S. In the central longitudes of the ocean the resulting easterly flow runs parallel to that of the colder water of the Southern Ocean current to the southward. Eastward of about long. 15°W., and southward of the 30th parallel, the east-going water turns north-eastward and northward and converges with the westerly flow which fans out from the seaward side of the Benguela current.

Nearer the South African coast, between longs. 10°E. and 15°E., a branch of the Southern Ocean current turns northward into the *Benguela current.* The water of the Benguela current is however mainly derived by upwelling of water from sub-surface depths off the south-west coast of Africa. A third source of Benguela current water is a branch of the *Agulhas current* of the South Indian ocean which rounds the south coast of Africa and so passes into the Benguela current.

The *Falkland current* does not form part of the main circulation. It branches northward from the Southern Ocean current, in the region of I. de los Estados and passes westward of the Falkland islands. Part of it continues northward to the estuary of Rio de La Plata; the remainder branches eastward in about lat. 40°S. to 42°S. and rejoins the northern part of the Southern Ocean current. During May to October, a northerly current continues northward of Rio de La Plata, and is known as the *Brazil Inshore Counter-current.* From May to July this may extend as far as Cabo Frio.

ICE

GENERAL REMARKS

The following brief account of ice in the Atlantic Ocean should not be taken as complete or in any way all-embracing. More detailed information than can be given here will be found in the following publications and the appropriate ones should be consulted before undertaking passages through areas in which ice is likely to be encountered.

Atlas of monthly ice charts of the Arctic Seas (M.O.M. 390a).

Atlas of monthly ice charts of the Western North Atlantic (M.O.M. 465).

The above are published by the Marine Branch of the Meteorological Office, Air Ministry.

Chart 1241—Ice chart of the southern hemisphere.

Admiralty Sailing Directions covering the appropriate areas.

A general statement regarding ice including warning signs of its proximity is given in Section A of this book.

A factor always to be borne in mind where ice conditions are concerned is their great variability from year to year. For this reason, and also on account of the sparsity of observations in many areas, the charted positions of ice limits must be regarded as approximate.

Ice that affects the mariner can be broadly divided into two types, though there are numerous sub-types, details of which will be found in the Admiralty Sailing Directions. These two main types of ice are:—

(*a*) Pack Ice—or frozen sea.

(*b*) Icebergs—or portions of ice which have broken off the seaward end of glaciers or, in the Antarctic, from the ice barrier, and been carried away by wind and current.

NORTH ATLANTIC OCEAN

Pack Ice. The approximate mean limits of pack ice in March-April and August-September, in which months it attains its greatest and least extent respectively, is indicated on climatic charts 5301 and 5302. A glance at these limits will suffice to show the paramount influence of the ocean currents; in the western part of the North Atlantic the cold waters of the Labrador current cause much of the Newfoundland Banks to be encumbered with ice from the latter part of January to May in the average year, while in the eastern part of the ocean the warm waters of the North Atlantic current cause the ice edge to recede far to the north, and maintain ice-free conditions over the whole of the ocean adjacent to north-west Europe, apart from a few localities of small extent where ice forms locally and which are mentioned later.

The following remarks regarding specific localities are intended only as a guide; a detailed description of ice conditions in the several areas will be found in the publications listed at the head of this section. Where dates are given they refer to average conditions.

Gulf of St. Lawrence Closed to navigation from the beginning of December to the end of April.

Strait of Belle Isle. Generally unnavigable from the first week in December to June.

Denmark strait. Normally the Icelandic side of the strait remains clear of ice throughout the year. Occasionally, however, pack ice may spread across the strait from the Greenland coast to Iceland for short periods between about December and early August. Whenever this has occurred it has been found to follow a prolonged period of south-westerly winds in the Denmark strait, which have the effect of hindering the discharge of ice through the strait by the East Greenland current. At least a fortnight of south-westerly winds is necessary to produce this extension of the ice, and such a prolonged period of south-westerlies in this region (where the prevailing wind is north-east) is rare.

White sea. Normally closed to navigation from mid-December to mid-May.

Kól'ski inlet. In exceptionally cold winters ice may be a hindrance occasionally for 3 or 4 days at a time.

Norway. Though ice may form at the heads of many of the fjords between December and March or April, none of the main ports on the west coast are ever closed by ice. Ice also forms along parts of the south-east coast and some of the minor ports may be closed. In the exceptionally severe winter of 1946-47 Oslo fjord was closed from mid-February to mid-March, but this is an extremely rare occurrence.

Helgoland bight. Serious ice conditions at the entrance to German, Dutch and Danish ports lasting from one to four weeks occur about 2 or 3 times in 10 years at some time between mid-January and early March.

Icebergs. All icebergs in the North Atlantic are formed by the breaking away of the lower or seaward portions of glaciers—a process known as " calving." The number of localities in which glaciers reach the open sea and where the latter is sufficiently deep for the broken-off portions (or bergs) to float away is very limited. Some bergs are calved from the glaciers of Spitzbergen but, owing to the comparative shallowness of the water only the smaller ones can float away, and consequently they do not penetrate far to the south before melting.

Practically all the icebergs which menace the North Atlantic shipping routes originate off the coasts of Greenland. The bergs calve during the summer and drift to seaward under the influence of wind and current. In due course they come under the influence of the Davis strait or Labrador current which carries them to the south. During the winter they are frozen into the pack ice, resuming their journey with the break-up of the pack in the spring. When they finally reach the trade routes they may be several years old.

The worst months are from about March to June or July, with May as the month of greatest frequency. Bergs are not often encountered southward of 40°N. or eastward of 40°W., though occasionally they may be met with considerably outside these limits. They are particularly prevalent around the eastern flank of the Great Bank of Newfoundland due to the shoal water deflecting a large part of the Labrador current together with the bergs which it carries, around this flank. This, combined with the fact that many of the larger bergs ground in the shoal water, renders the Banks themselves considerably safer than the deep water.

International Ice Patrol

This service begins in February and continues until June or longer if necessary. Its primary object is to ascertain the limits of the pack ice and icebergs in the vicinity of the Great Banks and to disseminate this information for the guidance of shipping. Full details of this service and other ice warnings will be found in the Admiralty List of Radio Signals Vol. II.

SOUTH ATLANTIC OCEAN

Pack Ice

The probable average position of the Antarctic pack in March-April and August-September is indicated in climatic charts 5301 and 5302. None of the normally inhabited parts of the southern hemisphere are affected by it, but in the South Atlantic its presence prevents the sailing of a great circle track from the Cape of Good Hope to Cabo de Hornos.

Icebergs

The Antarctic Icebergs, unlike those of the North Atlantic, are not in the majority of cases calved from glaciers, but consist of portions that have broken away from the great ice barrier. They are consequently flat-topped and they may be of immense size.

The mean limit of icebergs in November and December, in which months it reaches farthest north, runs from about 100 miles south of Cabo de Hornos in a north-easterly direction through the Falkland Islands to about latitude 43°S., longitude 50°W.; the mean northern limit in these months varies between the 43rd and 45th parallel over the remainder of the South Atlantic. As in the North Atlantic bergs may be met with well north of these limits at times; the extreme limits are shown on chart 1241.

In May and June, which are the months of least extent, the approximate mean limit of bergs runs from a similar position off Cabo de Hornos, south of the Falklands to about latitude 50°S. longitude 50°W.; from here to longitude 20°W. the mean limit is between latitude 47°S. and 50°S., east of which to the longitude of Capetown it varies between about latitude 50°S. and 54°S.

SECTION B. PART I

Chapter II

ROUTES FROM PORTS ON THE EASTERN SIDE OF THE ATLANTIC OCEAN FROM NORTH TO SOUTH

GENERAL REMARKS

North Atlantic Lane Routes

The large number of steam vessels crossing the Atlantic, and their high rates of speed has necessitated the adoption of clearly defined separate routes to be followed by outward and homeward bound ships; such routes to be adapted to the ice conditions most probable at different periods of the year. These are known as the *North Atlantic Lane Routes*, and are shown in full detail on Admiralty Charts Nos. 2058b and 2058c, the former showing tracks from the English Channel and southward of Ireland to Canada and the United States, and the latter showing tracks from northward of Ireland to Canada and the United States. These " lane routes " have been given a letter for simplification of reference; they are described in the routes that follow.

These routes are recommended for all classes of steamers, both high-powered, moderate, and low-powered; but masters of all ships—both steamers and sailing ships who do not, or cannot make use of the " lane routes," should make themselves acquainted with them, for their own safety as well as that of the other vessels which do use them.

Vessels, by following these routes, not only reduce to a minimum the danger of collision with each other or with ice (always one of the chief dangers of this navigation), but in case of a breakdown of machinery are almost certain of receiving assistance from other vessels following the same route.

The date on which tracks change is to apply to the meridian of Fastnet for westbound vessels and the meridian of 70° W. for eastbound vessels.

Caution. Westbound ships must take care not to pass to the southward of the authorised tracks; eastbound ships should not pass to the northward of their authorised routes.

Special tracks, west-bound or east-bound, will be agreed by telegraphic communication between the companies when varying circumstances, owing to abnormal conditions, may make such special tracks advisable. These special tracks, or alterations in the dates of using certain " lane routes " are notified by Notice to Mariners and the latest Notice on the subject should be consulted.

Optional Tracks

Canadian Tracks. Vessels bound to or from United States ports from or to the north of Ireland have the option of following either the United States or the Canadian seasonal tracks " D," " E " and " F," remaining on track " F " during the operative dates of track " G."

On tracks " E " and " F " vessels should pass 40 miles southward of Sable island when westbound, thence to a position close southward of Nantucket; and when eastbound should steer from position lat. 40° 10′ N., long. 70° 00′ W. to position 60 miles southward of Sable island.

On track " D," westbound vessels should proceed by Rhumb line from position lat. 43° 00′ N., long. 50° 00′ W. to position close southward of Nantucket; and when eastbound, from position lat. 40° 10′ N., long. 70° 00′ W. to position lat. 42° 00′ N., long. 50° 00′ W.

Masters of vessels encountering ice, have permission to deviate from these tracks, and, after the end of October, to leave the Belle Isle route for the more southerly route at their discretion, according to weather conditions. Should vessels on Track " C " bound to or from the United States be deviated to Track " B " on account of ice, Canadian vessels will remain on Track " D " for the period prescribed, but will have the option of deviating as necessary in the vicinity of ice areas.

United States Tracks. Vessels bound to or from United States ports calling at Halifax have the option of following either the Canadian or the United States seasonal tracks to or from that port, passing 40 miles southward of Sable Island when westbound and 60 miles southward of Sable Island, eastbound, when proceeding on United States tracks, and Canadian track " D." When proceeding on Canadian tracks " E " and " F," via Halifax, vessels pass northward of Sable island both westbound and eastbound.

Vessels bound to Portland (Maine) may follow the Canadian seasonal tracks.

Newfoundland Coasts

CAUTIONS

Currents. As fog is exceedingly prevalent off the south coast of Newfoundland, especially during June and July, vessels should guard against the set of the current and the indraught into the deep bays.

When approaching from the eastward in thick weather, the Ballard bank, which extends 15 miles nearly parallel to the shore is nearly sure to be crossed, and a careful comparison of the soundings with those on the chart will show the position of the vessel with sufficient accuracy to enable the navigator to round Cape Race.

Although the current between the Great bank and Newfoundland is ordinarily to the south-westward, sometimes at a rate of nearly one knot, it is not invariably so, and near the shore in moderate weather it changes with the tide and runs at a weaker rate in the opposite direction.

Westward of Cape Race, the current setting to the north-westward at the rate of about one knot, normally is affected greatly by the prevailing winds. It normally runs in upon the eastern side of the great bays indenting the south coast of Newfoundland, and out upon the western. In the offing it is influenced by the winds, and near the shore it is altered and influenced by the tides, so that during spring tides the stream of ebb runs weakly to the south-eastward, and the stream of flood to the north-westward, the latter sometimes at the rate of two knots round the headlands. *See also remarks on currents in Chapter I, page 37.*

Soundings. When approaching and passing Capes Race and Pine vessels should obtain frequent soundings.

Approaching from the eastward, after crossing Great bank, the water deepens to about 100 fathoms; it then shoals on Ballard bank, and after again deepening to 40 fathoms, shoals gradually to the shore.

Approaching from the westward, in thick weather vessels should not close Capes Pine and Race into depths of less than 30 fathoms.

Ice.—There may be icebergs off this coast at nearly all seasons. In March, April, May, June, and sometimes July, field ice is often encountered, either on the banks or nearer to Newfoundland. The earliest recorded time of the arrival of northern ice at Cape Race is 17th January, and the latest, 12th April; the average time is about the first week in February. The time of the clearance of the ice varies from 25th February to 7th June; the average time is about the middle of April. *See also remarks on Ice in Chapter I, page 37.*

Magnetic Variation. — The magnetic variation changes rapidly on the coasts of Newfoundland and Labrador. This change amounts to one degree in about 70 miles in the vicinity of Cape Race, in about 37 to 55 miles on the west coast of Newfoundland, and in about 60 miles near the Straits of Belle Isle.

The deviation of the compass should be ascertained when approaching Newfoundland, as the large scale of magnetic dip and the small horizontal force in this region may cause the deviation to be different from that determined in other places.

In many parts of Newfoundland and Labrador local magnetic anomalies affect compasses on shore. Although it is not possible that these disturbing forces can extend to vessels navigating off the coasts, areas of disturbance may exist in places at the bottom of the sea, and may affect the compasses of vessels when in shallow water. Actual experiences of this kind have occurred, but they are not common. In water exceeding 50 fathoms (91^{m}4) in depth no effect has been observed.

Cabot strait

Steam vessels proceeding through Cabot strait in the spring, and with clear weather, should pass the signal-station on Galantry head, St. Pierre island, within signalling distance, and obtain information as to the state of the ice; or, failing this, obtain the information either from the signal-station on Cape Ray, or that on St. Paul island. After the ice has disappeared, generally about the end of May, they should keep farther off Galantry head, to avoid the dense fog that prevails in that locality during June and July; and should guard against the strong current that occasionally sets into the bays on the south coast of Newfoundland; in fact, during this period, it is better to be nearer St. Paul island than Cape Ray. *See* Newfoundland and Labrador Pilot.

(i) ROUTES FROM SCANDINAVIAN PORTS AND ICELAND

Note.—The distance from Nordkapp to Múrmansk is 230 miles and that to Archangel is 600 miles.

Route 1. Nordkapp to Reykjavik

Proceed as direct as prudent navigation will allow. The last 300 miles of the passage skirts the south coast of Iceland, directions for which will be found in Arctic Pilot, Vol. II.

Magnetic Compass. CAUTION. The directive force of the magnetic needle is weak, in the vicinity of Nordkapp; and local magnetic anomaly has been reported off the south coast of Iceland.

Distance from Nordkapp to Reykjavik 1236 miles.

Route 2. Nordkapp to Greenland and Hudson bay

(1) To CAPE FAREWELL (75 miles south of) proceed as direct as navigation will allow, passing 20 miles southward of Jan Mayen island, and through the Denmark strait. When the Denmark strait is closed by ice the passage must be made south of Iceland, which will increase the distance by about 102 miles.

(2) TO WEST COAST OF GREENLAND AND HUDSON BAY.—Follow Route 2 (1) to Cape Farewell, and thence as direct as prudent navigation will permit.

Directions for the navigation of the west coast of Greenland and for Hudson strait and Hudson bay will be found in Arctic Pilot, Vol. III.

Ice. General information about the probable ice conditions on these routes will be found in Arctic Pilot, Vols. II. and III.

Magnetic Compass. CAUTION. The directive force of the magnetic needle is weak on these routes particularly in Hudson strait and in Hudson bay.

Distances from Nordkapp to Cape Farewell (75 miles south of), 1830 miles; to Churchill harbour, 3,440 miles; to Disko bugt (Godhavn), 2,599 miles; to Ivigtut, 2,070 miles.

Route 3. Nordkapp to Strait of Belle Isle and River St. Lawrence

Follow Route 2 (1) as far as Cape Farewell, and thence of Belle Isle as direct as prudent navigation permits; thence proceed to the River St. Lawrence, passing north or south of Anticosti, the difference in distance being about 17 miles only.

Note. When the Denmark strait is closed by ice, passage must be made south of Iceland, the distance being some 120 miles longer.

Distance from Nordkapp to Belle Isle (7′ south of), 2,394 miles; to Father point (St. Lawrence), 2,953 miles

Route 4. Nordkapp to Halifax or New York

Proceed on the Great Circle track to lat. 57° 50′ N., long. 18° 00′ W., and then follow the tracks from Cape Wrath. *(See Routes* 21 *and* 22).

Distances from Nordkapp are: (a) via Cape Race; (b) via lat. 45° 55′ N., long. 50° 00′ W.; (c) via lat. 43° 00′ N., long. 50° 00′ W. To Halifax (a), 3,239 miles; (b), 3,297 miles; (c), 3,439 miles. To New York (a), 3,793 miles; (b), 3.904 miles; (c), 4,021 miles.

Route 5. Trondheim to Reykjavik

Proceed as direct as navigation will allow, passing southward of Iceland.

Distance from Trondheim to Reykjavik, 958 miles.

Route 6. Trondheim to Greenland and Hudson bay

Proceed as direct as navigation will permit to Cape Farewell, passing south of Iceland, then continue as in Route 2 (2).

Distance from Trondheim to Cape Farewell (75 miles south of), 1,590 miles; to Churchill harbour, 3,200 miles; to Disko bugt (Godhavn), 2,359 miles; to Ivigtut, 1830 miles.

Route 7. Trondheim to Belle Isle and River St. Lawrence

Proceed on the Great Circle track to a position 7 miles southward of Belle Isle, passing southward of Iceland, and thence as in Route 3.

Distance from Trondheim to Belle Isle, 2,135 miles; to Father point, 2,626 miles.

Route 8. Trondheim to Halifax or New York

(1) To HALIFAX.

(*a*) *By Cape Race.* Proceed on the Great Circle track to a position 10 miles south of Cape Race and thence as direct as navigation will allow.

(*b*) *Via lat.* 45° 55′ *N., long.* 50° 00′ *W.*—Proceed by Rhumb line to a position 10 miles northward of the Færöes, thence by Great Circle to lat. 45° 55′ N., long. 50° 00′ W., and thence on a direct Rhumb line track to Halifax, passing about 60 miles northward of Sable island.

(*c*) *Via lat.* 43° 00′ *N., long.* 50° 00′ *W.* Proceed by Rhumb line to a position 10 miles southward of the Færöes, thence by Great Circle to lat. 43° 00′ N., long. 50° 00′ W., and thence on Rhumb line tracks to Halifax, passing not less than 40 miles southward of Sable island.

Distance from Trondheim to Halifax by *(a)*, 2,773 miles; by *(b)*, 2,836 miles; by *(c)*, 3,005 miles.

(2) To NEW YORK.

(*a*) *By Cape Race.* Proceed by the Great Circle track to a position 10 miles southward of Cape Race and thence by Rhumb line tracks, passing at least 40 miles southward of Sable island and through lat. 40° 23′ N., long. 69° 48′ W.

(*b*) *Via lat.* 43° 00′ *N., long.* 50° 00′ *W.* Proceed by a Rhumb line to a position 10 miles southward of the Færöes; thence on the Great Circle track to lat. 43° 00′ N., long. 50° 00′ W; thence by Rhumb line tracks to New York, passing through lat. 40° 23′ N., long. 69° 48′ W.

(*c*) *Via lat.* 41° 30′ *N., long.* 47° 00′ *W.* Proceed by Rhumb line to a position 10 miles southward of the Færöes; thence by a Great Circle track to lat. 41° 30′ N., long. 47° 00′ W., and thence by Rhumb lines to New York, passing through lat. 40° 23′ N., long. 69° 48′ W.

Note. Choice of route should be decided by the North Atlantic Lane Route in force. *See* page 41.

Distance from Trondheim to Ambrose light vessel by *(a)*, 3,315 miles; by *(b)*, 3,487 miles; by *(c)*, 3,600 miles.

Route 9. Bergen to Reykjavik

Proceed as direct as navigation will allow, passing to the northward of the Færöes.

Distance from Bergen to Reykjavik, 870 miles.

Route 10. Bergen to Greenland and Hudson bay

Proceed as direct as navigation will allow, passing northward of Shetland and southward of Færöes, to a position 75 miles south of Cape Farewell, and then continue as in Route 2 (2).

Distance from Bergen to Cape Farewell, 1,503 miles; to Churchill harbour, 3,113 miles; to Disko bugt (Godhavn), 2,272 miles; to Ivigtut, 1,743 miles.

Route 11. Bergen to Belle Isle and River St. Lawrence

Follow the Great Circle track (passing southward of the Færöes) to a position 7 miles south of Belle Isle; thence continue as in Route 3.

Distance from Bergen to Belle Isle, 2,028 miles; to Father point, 2,587 miles.

Route 12. Bergen to Halifax or New York

Follow the general directions given in Route 8, except that the point of departure for the various Great Circle courses is Sumburgh Head, Shetlands, which is reached on a Rhumb line course from Bergen.

Distances from Bergen are:

To Halifax, using directions, in 8 (1) (a), 2,638 miles; 8 (1) (b), 2,690 miles; 8 (1) (c), 2,842 miles.

To Ambrose L.V. (New York), using directions in 8 (2) (a), 3,180 miles; 8 (2) (b), 3,313 miles; 8 (2) (c), 3,424 miles.

Route 13. Lindesnes (The Naze) to Reykjavik

Proceed as direct as navigation will allow.

Distance from Lindesnes to Reykjavik 985 miles.

Route 14. Lindesnes (The Naze) to Greenland and Hudson bay

Follow the Great Circle track to a position 75 miles southward of Cape Farewell, passing southward of Fair island, and thence continue as in Route 2 (2).

Distances from Lindesnes to Cape Farewell, 1,571 miles; to Churchill harbour, 3,181 miles; to Disko bugt (Godhavn), 2,340 miles; to Ivigtut, 1,811 miles.

Route 15. Reykjavik to Greenland and Hudson bay

Proceed on as direct a course as navigation will allow to a position 75 miles southward of Cape Farewell and thence continue as in Route 2 (2).

Distance from Reykjavik to Cape Farewell, 715 miles; to Churchill harbour, 2,525 miles; to Disko bugt (Godhavn), 1,684 miles.

Route 16. Reykjavik to Halifax and New York

Proceed on a Great Circle track to one of the positions given in Route 8 (1) (a), (b), (c), or (2) (a), (b), (c); thence follow Route 8 to destination. The choice of route should be decided by the North Atlantic Lane Route in force.

Distances from Reykjavik are:

To Halifax, using 8 (1) (a), 1,947 miles; using 8 (1) (b), 2,033 miles; using 8 (1) (c), 2,183 miles.

To Ambrose L.V., using 8 (2) (a), 2,490 miles; using 8 (2) (b), 2,651 miles; using 8 (2) (c), 2,669 miles.

Route 17. Reykjavik to Ports in the United Kingdom and Europe.

The track is in all cases as direct as prudent navigation permits.

Distances from Reykjavik are: To Avonmouth, 1,100 miles; to Greenock, 834 miles; to Grimsby, 1,037 miles; to Kirkwall, 692 miles; to Leith, 884 miles; to Liverpool, 923 miles; To Tilbury Docks, 1,205 miles.

See also Routes 1 (Nordkapp), 5 (Trondheim), 9 (Bergen), 24 (Inishtrahull), and 75 (Gibraltar), each of which should be taken in reverse.

Route 18. *Reserved as spare.*

(ii) ROUTES FROM BRITISH ISLES AND THE ENGLISH CHANNEL.

(A) Vessels from North sea or Baltic ports proceeding round the North of Scotland.

See the General Remarks and Cautions at the beginning of this chapter on pages 41 and 42.

Distance from Cape Wrath to København, 653 miles; to Bergen, 345 miles; to Hull, 419 miles; to Leith 254 miles; to Oslo, 575 miles; The Skaw, 503 miles.

Route 19. Cape Wrath to Greenland and Hudson bay

Proceed by the Great Circle track or Rhumb line (which is only 17 miles longer) to a position 75 miles south of Cape Farewell, and thence continue as in Route 2 (2).

Distance from Cape Wrath to Cape Farewell, 1,200 miles; to Churchill harbour, 2,810 miles; to Disko bugt (Godhavn), 1,969 miles; to Ivigtut, 1,440 miles.

Route 20. Cape Wrath to Gulf of St. Lawrence

(a) April 11*th to May* 15*th (inclusive) or until the Cape Race route is clear of ice.*—Follow the Great Circle track to lat. 45° 55′ N., long. 50° 00′ W., and thence proceed as directly as navigation will allow, through Cabot strait to destination. *See* Caution on page 42.

(b) May 16*th to opening of Strait of Belle Isle, or to November* 30*th (if not using Strait of Belle Isle).*

Follow the Great Circle track to a position 10 miles south of Cape Race, and thence continue through Cabot strait to destination. *See* Caution on page 42.

(c) From opening of Strait of Belle Isle to November 14th). Follow the Great Circle track to a point 7 miles south of Belle Isle and thence to destination.

Distance from Cape Wrath to Montreal, by (a), 2,872 miles; by (b), 2,810 miles; by (c), 2,582 miles.

Route 21. Cape Wrath to Halifax.

Follow the Great Circle track to a position lat. 57° 50′ N., long. 18° 00′ W. and thence as follows, according to season.

(a) February 15*th to April* 10*th (both days inclusive)*.—Great Circle track to lat. 43° 00′ N., long. 50° 00′ W.; and thence on Rhumb line tracks to Halifax, passing not less than 40 miles south of Sable island.

(b) April 11*th to May* 15*th (both days inclusive), and from December* 1*st to February* 14*th*.—Great Circle track to lat. 45° 55′ N., long. 50° 00′ W., and thence on a direct Rhumb line track to Halifax, passing about 60 miles northward of Sable island.

(c) May 16*th to November* 30*th (both days inclusive)*. Continue on the Great Circle track from Cape Wrath direct to a point 10 miles south of Cape Race, and thence on a Rhumb line to destination.

Distance from Cape Wrath to Halifax by (a), 2,517 miles; by (b), 2,365 miles; by (c), 2,317 miles.

See notes " Newfoundland coasts " on page 41.

Route 22. Cape Wrath to New York

Follow the Great Circle track to a position lat. 57° 50′ N., long. 18° 00′ W., and thence as follows, according to season.

(a) April 11*th to June* 30*th (both days inclusive)*. Great Circle track to lat, 41° 30′ N., long. 47° 00′ W.; thence either by Rhumb line or Great Circle to a position about 10 miles south of Nantucket Light Vessel; and thence to New York.

(b) July 1*st to April* 10*th (both days inclusive)*. Great Circle track to lat. 43° 00′ N., long. 50° 00′ W.; thence either by Rhumb line or Great Circle to a position close southward of Nantucket Light Vessel; and thence to New York.

Distance from Cape Wrath to New York (Ambrose Light Vessel), by (a), 3,099 miles; by (b), 2,982 miles.

Route 23. *Reserved as spare.*

(B) Vessels proceeding round the North of Ireland

See Remarks and Cautions at the beginning of this Chapter.

Distances from Inishtrahull are: Belfast, 84 miles; Greenock, 118 miles; Liverpool, 199 miles.

Route 24. Inishtrahull to Reykjavik

Proceed as direct as navigation will allow.

Distance from Inishtrahull to Reykjavik, 728 miles.

Route 25. Inishtrahull to Greenland and Hudson bay

Proceed by Great Circle or Rhumb line track (which is only 15 miles longer) to a position 75′ south of Cape Farewell, and thence continue as in Route 2 (2).

Distance from Inishtrahull to Cape Farewell, 1,197 miles; to Churchill harbour, 2,807 miles; to Disko bugt (Godhavn), 1,966 miles; to Ivigtut, 1,437 miles.

Route 26. Inishtrahull to Gulf of St. Lawrence and to St. John's, Newfoundland

(1) To GULF OF ST. LAWRENCE.

(a) April 11*th to May* 15*th* (*both days inclusive*) *or until the Cape Race route is clear of ice*.—Follow the Great Circle track to lat. 45° 55′ N., long. 50° 00′ W., and thence as directly as navigation permits, through Cabot strait, to destination. *See Admiralty Chart* 2058c. *Track E (Westbound)*.

(b) May 16*th to opening of Strait of Belle Isle and to November* 30*th when not using Strait of Belle Isle*.—Steer on a course 10 miles northward of the Great Circle track until approaching Cape Race, then steer to pass 10 miles southward of Cape Race, and thence through Cabot strait to destination. *See Admiralty Chart* 2058c. *Track F. (Westbound)*.

(c) From opening of Strait of Belle Isle to November 14*th*.—Follow a track 10 miles northward of the Great Circle until approaching Belle Isle; thence through the strait to destination. *See Admiralty Chart* 2058c. *Track G (Westbound)*.

(2) To ST. JOHNS; NEWFOUNDLAND (all seasons).—Take the Great Circle track direct.

Distance from Inishtrahull to Montreal by (1) (a), 2,786 miles; (1) (b), 2,737 miles; (1) (c), 2,565 miles; to St. John's, by (2), 1,728 miles.

Route 27. Inishtrahull to Halifax and to Boston and New York

(1) To HALIFAX.

(a) February 15*th to April* 10*th (both days inclusive)*.—Proceed on the Great Circle track to lat. 43° 00′ N., long. 50° 00′ W., and thence on Rhumb line tracks to Halifax, passing not less than 40 miles south of Sable island. *See Admiralty Chart* 2058c. *Track D (Westbound)*.

(b) April 11*th to May* 15*th (both days inclusive), or until the Cape Race route is clear of ice, and from December* 1*st to February* 14*th*.—Follow the Great Circle track to lat. 45° 55′ N., long. 50° 00′ W., and thence on a direct Rhumb line track to Halifax, passing about 60 miles north of Sable island. *See Admiralty Chart* 2058c. *Track E (Westbound)*.

(c) May 16*th to November* 30*th (both days inclusive)*.—Follow a course 10 miles northward of the Great Circle track until approaching Cape Race, thence by Rhumb line to Halifax. *See Admiralty Chart* 2058c. *Track F (Westbound)*.

(2) To BOSTON or NEW YORK.

(a) Extra Southern. Only brought into operation when necessity arises.—Follow the Great Circle track to lat. 40° 30′ N., long. 47° 00′ W., then by Rhumb line or Great Circle to Boston light vessel, or to a position close southward of Nantucket light vessel, and thence to New York. *See Admiralty Chart* 2058c. *Track A (Westbound)*.

(b) April 11*th to June* 30*th (both days inclusive), except when ice conditions necessitate the use of Track A*.—Follow the Great Circle track to lat. 41° 30′ N., long. 47° 00′ W., then by Rhumb line or Great Circle to Boston light vessel, or to a position close southward of Nantucket light vessel, and thence to New York. *See Admiralty Chart* 2058c. *Track B (Westbound)*.

(c) July 1*st to April* 10*th (both days inclusive), except when ice conditions necessitate the use of Track B*.—Follow the Great Circle track to lat. 43° 00′N., long. 50° 00′ W., then by Rhumb line or Great Circle to Boston light vessel, or to a position close southward of Nantucket light vessel, and thence to New York. *See Admiralty Chart* 2058c. *Track C (Westbound)*.

Note.—The courses across the Atlantic, when westbound, should be made nothing to the southward of the actual Great Circle track.

Distance from Inishtrahull by the above routes are: To Halifax, 1 (a), 2,413 miles; 1 (b), 2,279 miles; 1 (c), 2,242 miles. To New York (Ambrose L.V.), 2 (a), 3.023 miles; 2 (b), 2,984 miles; 2 (c), 2,884 miles. To Boston light vessel, 2 (a), 2,872 miles; 2 (b), 2,819 miles; 2 (c), 2,716 miles.

Route 28. *Reserved as spare.*

Route 29. *Reserved as spare.*

(C) Vessels proceeding round the South of Ireland

See Remarks and Cautions at the beginning of this Chapter on page 41.

Distances from Fastnet to Avonmouth, 262 miles; to Bishop rock, 148 miles; to Cobh, 63 miles; to Dun Laoghaire, 209 miles; to Liverpool, 291 miles.

Route 30. Fastnet to Greenland and Hudson bay

Proceed on a Great Circle track to a position 75 miles south of Cape Farewell, and thence continue in Route 2 (2).

Distance from Fastnet to Cape Farewell, 1,242 miles; to Churchill harbour, 2,852 miles; to Disko bugt (Godhaven), 2,011 miles; to Ivigtut, 1,482 miles.

Route 31. Fastnet to Gulf of St. Lawrence

(a) April 11th to May 15th (inclusive), or until the Cape Race route is clear of Ice.—Follow the Great Circle track to lat. 45° 55′ N., long. 50° 00′ W., and thence as directly as navigation permits, through Cabot strait to destination. *See Admiralty Chart* 2058b. *Track E* (*Westbound*).

(b) May 16th to the opening of Strait of Belle Isle and to November 30th, when not using Strait of Belle Isle.—Follow a track 10 miles north of the Great Circle between Fastnet and a position 10 miles south of Cape Race until approaching Cape Race; pass 10 miles south of Cape Race, and thence through Cabot strait to destination. *See Admiralty Chart* 2058b. *Track F (Westbound).*

(c) Opening of Strait of Belle Isle to November 14th.—Follow a track 10 miles to the northward of the Great Circle between Fastnet and a position 7 miles south of Belle Isle, until approaching Belle Isle; thence continue through the strait to destination. *See Admiralty Chart* 2058b. *Track G (Westbound).*

Distance from Fastnet to Montreal by (a), 2,707 miles; by (b), 2,676 miles; by (c), 2,551 miles.

Route 32. Fastnet to St. John's, Newfoundland. All seasons

Take the Great Circle track, direct.

Distance from Fastnet to St. John's, 1,672 miles.

Route 33. Fastnet to Halifax

(a) February 15th to April 10th (inclusive).—Proceed on the Great Circle track to lat. 43° 00′ N., long. 50° 00′ W. and thence on Rhumb line tracks to Halifax, passing not less than 40 miles south of Sable island. *See Admiralty Chart* 2058b. *Track D* (*Westbound*).

(b) April 11th to May 15th (inclusive) and from December 1st to February 14th (inclusive).—Proceed on the Great Circle track to lat. 45° 55′ N., long. 50° 00′ W., and thence on the direct Rhumb line track to Halifax, passing about 60 miles north of Sable island. *See Admiralty Chart* 2058b. *Track E* (*Westbound*).

(c) May 16th to November 30th (inclusive).—Follow a track 10 miles northward of the Great Circle between Fastnet and a position 10 miles south of Cape Race; until approaching Cape Race thence, passing 10 miles south of Cape Race, proceed by direct Rhumb line track to Halifax. *See Admiralty Chart* 2058b. *Track F (Westbound).*

Distance from Fastnet to Halifax by (a), 2,312 miles; by (b), 2,199 miles; by (c), 2,181 miles.

Route 34. Fastnet to Boston or New York

(a) Extra Southern. Only brought into operation when necessity arises.—Follow the Great Circle tracks to lat. 40° 30′ N., long. 47° 00′ W., then by Rhumb line to Boston light vessel; or by Rhumb line tracks to New York, passing close southward of Nantucket light vessel. *See Admiralty Chart* 2058b. *Track A* (*Westbound*).

(b) April 11th to June 30th (inclusive), except when ice conditions necessitate the use of the Extra Southern Route. (*See* above).—Follow the Great Circle track to lat. 41° 30′ N., long. 47° 00′ W.; then continue by Rhumb line to Boston light vessel; or by Rhumb line tracks to New York, passing close southward of Nantucket light vessel. *See Admiralty Chart* 2058b. *Track B* (*Westbound*).

(c) July 1st to April 10th (inclusive), except when ice conditions necessitate the use of (b) above.—Great Circle track to lat. 43° 00′ N., long. 50° 00′ W.; then continue by Rhumb line tracks to Boston light vessel; or to New York passing close southward of Nantucket light vessel. *See Admiralty Chart* 2058b. *Track C* (*Westbound*).

Distances from Fastnet by tracks (a), (b) and (c), above are: To New York (Ambrose light vessel), (a), 2,895 miles; (b), 2,855 miles; (c), 2,783 miles. To Boston light vessel, (a), 2,744 miles; (b), 2,697 miles; (c), 2,615 miles.

Route 35.—*Reserved as spare.*

(D) Vessels proceeding from the English channel

See the remarks on " North Atlantic Lane Routes " on page 41, and the Cautions regarding " Newfoundland Coasts " on page 41, and on " Cabot strait " on page 42.

Note.—The Routes which follow, designated above as from " Channel," are from the Bishop rock Lighthouse *(Lat. 49° 52′ N., Long. 6° 27′ W)*, the distances being calculated from that point.

In Table I. below the distance from Bishop rock to certain selected ports in the Irish sea, English channel, and southern North sea, is given. The sum of any one of these distances and that given from Bishop rock under each route, minus the distance given in Table II., if applicable, gives the *approximate* true distance in each case.

Table I.—Distances from Bishop rock to ports in the Irish sea, English channel, and southern North sea.

Antwerp	450 miles	Dover	314 miles	Hamburg	695 miles	Southampton ...	219 miles
Avonmouth ...	179 ,,	Fastnet	148 ,,	Liverpool	283 ,,	Tilbury	384 ,,
Cherbourg ...	190 ,,	Greenock	369 ,,	Plymouth	97 ,,		

Table II.—Correction to be applied to the sum of the Route distances from Bishop rock and the distances in Table I. *See* Note above.

To	From Plymouth	From Southampton	From Cherbourg	From Dover & beyond
Gibraltar or Cape Town	— 35 miles	— 50 to 60 miles	— 70 to 80 miles	— 60 to 70 miles
Madeira	— 25 miles	— 50 miles	— 70 miles	— 50 miles
Rio de Janeiro	— 20 to 25 miles	— 40 to 50 miles	— 60 to 70 miles	— 50 to 60 miles
Rio Amazonas	No correction	— 10 to 20 miles	— 30 to 40 miles	— 40 miles
Trinidad to northward	No correction	No correction	No correction	No correction

Fisheries. CAUTION. Trawling is carried on throughout the year from the Scilly isles to the Bay of Biscay, and even farther southward. Fishing fleets are generally in the line of traffic between Land's End and the Lizard.

Care should be taken to pass a single trawler at a distance of at least one cable; passing to windward, on account on the trawl being towed from the weather quarter.

Drifters may be met off the Cornish coast between March and September. They are usually met with in large clusters, sometimes of many hundreds of boats covering 40 to 60 square miles of sea. They should, if possible, be avoided altogether. If possible, propellers should be stopped while passing over nets.

For further information on Fishing boats, *see* Channel Pilot, Part I.

For information as to the Approaches to the Channel from the westward, *see* Channel Pilot, Part I.

Route 36. Bishop rock to Gulf of St. Lawrence.

(a) April 11th to May 15th (inclusive), or until the Cape Race route is clear of ice.—Follow the Great Circle track to lat. 45° 55′ N., long. 50° 00′ W., and thence continue as directly as navigation permits through Cabot strait, to destination. *See Admiralty Chart* 2058b. *Track E (Westbound).*

(b) May 16th to opening of Strait of Belle Isle, and to November 30th, when not using Strait of Belle Isle. Follow a course 10 miles northward of Great Circle track between Bishop rock and a position 10 miles south of Cape Race, until approaching Cape Race; then steer to pass 10 miles southward of Cape Race, and thence through Cabot strait to destination. *See Admiralty Chart* 2058b. *Track F (Westbound).*

(c) Opening of Strait of Belle Isle to November 14th.—Follow a course 10 miles northward of the Great Circle track from Bishop rock to a position 7 miles south of Belle Isle, until approaching Belle Isle; thence pass through the strait to destination. *See Admiralty Chart* 2058b. *Track G (Westbound).*

Distance from Bishop rock to Montreal by (a), 2,838 miles; by (b), 2,807 miles; by (c), 2,705 miles.

Route 37. Bishop rock to St. John's, Newfoundland.

All seasons.

Take the Great Circle track direct.

Distance from Bishop rock to St. John's, 1,806 miles.

Route 38. Bishop rock to Halifax.

(a) February 15th to April 10th (both days inclusive).—Follow the Great Circle track to lat. 43° 00′ N., long. 50° 00′ W., and thence continue on Rhumb line tracks to Halifax, passing not less than 40 miles south of Sable island. *See Admiralty Chart* 2058b. *Track D (Westbound).*

(b) April 11th to May 15th (both days inclusive) and from December 1st to February 14th (inclusive). Follow the Great Circle track to lat. 45° 55′ N., long. 50° 00′ W., and thence continue on a direct Rhumb line track to Halifax, passing about 60 miles north of Sable island. *See Admiralty Chart* 2058b. *Track E (Westbound).*

(c) May 16th to November 30th (inclusive).—Keep on a track 10 miles northward of the Great Circle between Bishop rock and a position 10 miles south of Cape Race, until approaching Cape Race. Thence steer to pass 10 miles south of Cape Race, and continue by Rhumb line track to Halifax. *See Admiralty Chart* 2058b. *Track F (Westbound).*

Distance from Bishop rock to Halifax by (a), 2,434 miles; by (b), 2,328 miles; by (c), 2,312 miles.

Route 39. Bishop rock to Boston or New York

(a) Extra Southern. Only brought into operation when necessity arises.—Follow the Great Circle track to lat. 40° 30′ N., long. 47° 00′ W.; continue by Rhumb line or Great Circle to Boston light vessel, or to a position close southward of Nantucket light vessel, and thence to New York. *See Admiralty Chart* 2058b. *Track A (Westbound).*

(b) April 11th to June 30th (both days inclusive), except when ice conditions necessitate the use of Track A.—Follow the Great Circle track to lat. 41° 30′ N., long. 47° 00′ W.; continue by Rhumb line or Great Circle to Boston light vessel, or to a position close southward of Nantucket light vessel and thence to New York. *See Admiralty Chart* 2058b. *Track B (Westbound).*

(c) July 1st to April 10th (both days inclusive), except when ice conditions necessitate the use of Track B.—Follow the Great Circle track to lat. 43° 00′ N., long. 50° 00′ W.; then continue by Rhumb line or Great Circle to Boston light vessel, or to a position close southward of Nantucket light vessel, and thence to New York. *See Admiralty Chart* 2058b. *Track C (Westbound).*

Distances from Bishop rock by (a), (b), or (c), above are: To Boston light vessel by (a), 2,855 miles; by (b), 2,811 miles; by (c), 2,737 miles. To New York (Ambrose light vessel), by (a), 3,006 miles; by (b), 2,969 miles; by (c), 2,905 miles.

Route 40. Bishop rock to Gulf of Mexico and to Bermuda

(1) To GULF OF MEXICO *via Providence channels.*

(a) April 11th to June 30th (both days inclusive).—Proceed on the Great Circle track to lat. 41° 30′ N., long. 47° 00′ W.; thence on a second Great Circle track to lat. 25° 50′ N., long. 77° 00′ W.; and thence through Providence channels and Florida strait to destination.

(b) April 10th to July 1st (both days inclusive).—Proceed on the Great Circle track to lat. 43° 00′ N., long. 50° 00′ W.; thence on a second Great Circle track to lat. 25° 50′ N., long. 77° 00′ W.; and thence as in (a), above, to destination.

(c) *Low-Powered Steamers. All Seasons.*—Proceed on the Great Circle track to lat. 36° 00′ N., long. 35° 00′ W., and thence on a second Great Circle track to lat. 25° 50′ N., long. 77° 00′ W., and thence as in (a), above, to destination.

Note.—In route (1) (a) and (1) (b) above, the voyage across the ocean is made by the North Atlantic lane routes, Tracks B and C. *See Route* 39 (b) and (c).

For continuation of above routes through the Gulf of Mexico, *See* Route 88.

(2) To GULF OF MEXICO *via Turks Island passage.* *(a) Normal route.*—Proceed on the Great Circle track to Faial (Arquipélago dos Açôres), and then by Rhumb line tracks, through lat. 36° 00′ N., long. 35° 00′ W., to lat. 21° 35′ N., long. 71° 10′ W., in Turks Island passage, and thence to destination, either by Old Bahama channel or by Windward passage. *See* Route 89.

(b) Alternative route, when bound from Continental ports, from Brest to the north-eastward.—Take a Great Circle track from a point off Cherbourg, to lat. 36° 40′ N., long. 24° 45′ W., south-eastward of Ilha de Santa Maria, Arquipélago dos Açôres; and thence a second Great Circle track to lat. 30° 00′ N., long. 45° 30′ W. From this point, proceed on a Rhumb line to lat. 21° 35′ N., long.

71° 10′ W., in Turks Island passage, and thence to destination as described in Route 89.

(3) To BERMUDA.—Proceed on the Great Circle track direct.

Distances from Bishop rock are:—

To Providence channel (*Lat. 25° 50′ N., Long. 77° 00′ W.*) by (1) (a), 3,521 miles; by (1) (b), 3,515 miles; by (1) (c), 3,747 miles.

To Turks Island passage (*Lat. 21° 35′ N., Long. 71° 10′ W.*), by (2) (a), 3,596 miles.

To Bermuda by (3), 2,762 miles.

The *distance* from Cherbourg to Turks Island passage by (2) (b) is 3,867 miles.

Route 41. Bishop rock to ports in Caribbean sea

(1) To BELIZE, *via Providence channels.* Take Route 40 (1) (a), (b) or (c) to Providence channel, and thence proceed to Belize as directly as navigation permits.

(2) To COLON, BELIZE, or KINGSTON. (*a*) *Via Windward passage.* Proceed on the Great Circle from Bishop rock to a position in lat. 36° 00′ N., long. 35° 00′ W., and thence on a Rhumb line, past Turks island, to Windward passage. From that point continue as directly as navigation permits to destination.

(b) Low-powered vessels. Proceed on a Great Circle track from Bishop rock to a position in lat. 36° 40′ N., long. 24° 45′ W., off Ilha de Sta. Maria (Arquipélago dos Açôres), and thence on a second Great Circle to lat. 30° 00′ N., long. 45° 30′ W. Thence continue on a Rhumb line to Windward passage to join (2) (a) above. The distances are all increased by 122 miles from those in (2) (a).

(3) To COLON or CURAÇAO (*See* also Route 42 (2)). *(a) Via Mona passage.* Follow the Great Circle track from Bishop rock to Mona passage; and thence continue on a Rhumb line to either destination.

(b) Low-powered vessels. Follow the Great Circle track from Bishop rock to lat. 38° 50′ N., long. 31° 00′ W., and thence take a second Great Circle track to Mona passage. Thence continue on a Rhumb line to either destination. The distances are increases by 34 miles over those by (3) (a).

(c) Via Sombrero Island passage. Proceed on the Great Circle track to Sombrero Island passage; thence continue on a Rhumb line to either destination.

(d) Low-powered vessels. Take first a Great Circle track from Bishop rock to lat. 37° 00′ N., long. 24° 30′ W., and then a second Great Circle track to Sombrero Island passage. Thence continue on a Rhumb line to either destination. Distances are increased by 172 miles over those by (3) (c).

(4) Alternative route to Sombrero Island passage from Continental ports from Brest to north-eastward. Take Route 41 (2) (b) to lat. 30° 00′ N., long. 45° 30′ W., and continue thence on a Great Circle to Sombrero Island passage.

Distances from Bishop rock are:—

To Belize by (1) (a) (using Route 40 (1) (a)), 4,408 miles; (using 40 (1) (b)), 4,402 miles; (using 40 (1) (c)), 4,634 miles; by (2) (a), 4,606 miles.

To Colon by (2) (a), 4,474 miles; by (3) (a), 4,351 miles; by (3) (c), 4,397 miles.

To Kingston (Jamaica), by (2) (a), 3,980 miles.

To Curaçao, by (3) (a), 3,860 miles; by (3) (c), 3,801 miles. *See* also Route 42 (2).

To Mona island by (3), 3,476 miles.

To Sombrero Island passage by (3) (c), 3,287 miles

See the increase of distance if either (2) (b), (3) (b) or (3) (d) is taken.

Note.—The distance from Cherbourg by (4) is 3,448 miles to Sombrero Island passage. Onward to Colon is 1,110 miles; to Curaçao it is 514 miles.

Route 42. Bishop rock to the West Indian islands between Puerto Rico and Trinidad, and to Curaçao

The whole chain of island is divided into two groups, viz., the Windward islands, from Martinique to Trinidad, both included; and the Leeward islands, viz., all the remainder, eastward of Puerto Rico.

(1) To the LEEWARD ISLANDS. The route is by the Sombrero Island passage (*see* Route 41 (3) (c) and (d)), and thence as directly as possible to destination.

(2) To the WINDWARD ISLANDS and to CURAÇAO. Follow the Great Circle track from Bishop rock to Barbados (passing close to the eastward of Ilhas das Flores and Ilha do Corvo (Arquipélago dos Açôres); thence proceed to destination as directly as navigation permits.

Distance from Bishop rock to Barbados, 3,405 miles; to Curaçao, 3,961 miles; to Trinidad, 3,606 miles.

Route 43. Bishop rock to Rio Amazonas

Take a Great Circle track to a position 10 miles north of Ponta Tijoca (at the entrance to Rio Para).

Distance from Bishop rock to Rio Amazonas, 3,680 miles.

Route 44. Bishop rock to Eastern Atlantic islands

(1) To ARQUIPÉLAGO DOS AÇÔRES. Follow the Great Circle track direct until within pilotage waters.

(2) To ARQUIPÉLAGO DE CABO VERDE. Follow the Great Circle track direct to Ilha de São Vicente (St. Vincent).

(3) To ILHA DA MADEIRA. Follow the Great Circle track direct passing about 60 miles westward of Ushant and of Cabo Finisterre.

(4) To ISLAS CANARIAS. Steer by Rhumb line to pass Cabo Villano at a distance of between 30 and 40 miles, and thence pick up the Great Circle track from Bishop rock to destination. This track avoids the home-coming traffic from the Mediterranean and the southward generally, which usually passes to the eastward.

Distance from Bishop rock by (1) to Horta, 1,165 miles; to Ponta Delgada, 1,108 miles; by (2) to São Vicente, 2,171 miles; by (3) to Madeira, 1,142 miles; by (4) to Las Palmas (Puerto de la Luz), 1,365 miles.

Route 45. Bishop rock to Eastern ports of South America

See South America Pilot, Part I, and Remarks on passages between the various ports on the east coast of South America on page 72

(1) To RECIFE (Pernambuco). As the direct Great Circle from Bishop rock to Recife passes through Ilha de São Vicente, vessels should, if not calling at that island, pass through the channel between Ilha de São Antas and Ilha de São Vicente, so as to get the full effect of the south-going current. Thence continue on the Great Circle to destination.

(2) To SOUTH AMERICAN PORTS, SOUTH OF RECIFE. Follow (1) above until the land is made in the vicinity of Recife; thence proceed as directly as prudent navigation permits to destination.

(3) To SOUTH AMERICAN PORTS calling at EASTERN ATLANTIC ISLANDS. Ships bound to South American ports frequently call at one or more of the eastern Atlantic islands, the total distance being very little increased by so doing.

Proceed in the first place as given in Route 44 (1), (2), (3), or (4), and continue thence as given in one or more of Routes 105, 106 (1), 112, 113, and 123.

Distance from Bishop rock (by (1) and (2)) to Bahia Blanca, 6,228 miles; to Recife, 3,785 miles; to Rio Janeiro, 4,851 miles; to Rio de La Plata (entrance), 5,843 miles; to Salvador (Baia), Pôrto do, 4,165 miles.

Note.—The amount by which the total distance will be increased by (3) above is:—

Calling at Madeira and São Vicente, about 16 miles.

Calling at Islas Canarias, about 37 miles.

Calling at Islas Canarias and São Vicente, about 65 miles.

Calling at Madeira, Islas Canarias, and São Vicente, about 124 miles.

Route 46. Bishop rock to West Coast of France, Coast of Spain, Lisbon, Gibraltar and to Casablanca

See Channel Pilot, Parts I and II, Bay of Biscay Pilot, West Coast of Spain and Portugal Pilot, and African Pilot, Part I.

(1) To West coast of France and North coast of Spain. Vessels from the English channel to the west coast of France, and the north coast of Spain may pass through the Chenal du Four, and the Raz de Sein, when the weather is clear, and the state of the tide is such that the streams will not be particularly strong in narrow places. These channels should not be used without pilots. If not using these channels, vessels pass about 10 miles outside Ushant and the same distance from the Chausée de Sein. In either case, the course is direct for the port of destination, if the weather is, and has been fine for a short time previously; but allowance should be made if strong westerly winds have lately prevailed.

If proceeding along the west coast of France, it is well to keep at about 12 miles off the land, in order to be outside the limits of the tidal streams.

caution. *Fogs near Ushant.*—It is not always possible to determine from the land the existence of fog-banks in the offing. Also, it is known that large areas of silence exist round many fog signal-stations, so, although the lights and fog signals of Ushant are of great power, no confidence can be felt in thick weather in seeing the lights, or hearing the fog-signal.

(2) To Lisbon. On leaving the Channel, steer so as to pass between 30 and 40 miles westward of both Ushant and Cabo Finisterre. Though these two points may be passed safely at a lesser distance in definitely fine weather, there is little mileage saved by so doing; and by taking the outer route as above, a vessel will be clear of the homeward bound traffic from the Mediterranean, which usually follows the inner route.

After westerly gales there is always a strong easterly set of current into the Bay of Biscay, and towards Cabo Finisterre and the west coast of Spain and Portugal, sometimes as much as 2 knots. An on-shore wind brings cloud that develops into fog or thick mist when it reaches the elevated land at both the northern and southern points of the Bay.

The coast between Cabo Ortegal and Cabo Finisterre is dangerous to approach at night, especially in winter, or in thick and foggy weather, which is frequent there; for, not only does a strong current at times set eastward towards the land, but the tidal streams also affect the position. In winter, the high land is often obscured, but the beaches at the foot of the hills, and off-lying islets and rocks may sometimes then be seen. Unless absolutely certain of the position, a very wide berth should be given to this coast at night or in thick weather. Many of the lights, beside being weak, are placed so high as frequently to be obscured by mist; and thus give no warning.

There is a most valuable bank of soundings fronting the whole coast, on which depths decrease so gradually as the land is approached, that the distance from it can be told with considerable accuracy by sounding. The depths on the bank, however, are such that unless soundings are taken continuously, and a depth of at least 70 fathoms ($128^{m}0$) reached at each cast, brief warning may be given. The 100-fathom ($182^{m}9$) line passes 11 miles from Cabo Ortegal and 10 miles from Cabo Finisterre.

The channel between Ilha Berlenga and Cabo Carvoeiro is clear and deep; both the Os Farilhões and the Ilha Berlenga may be seen from a distance of 24 miles, and the Peninsula de Peniche at nearly the same distance; all are easily distinguished. This channel, therefore, may be taken without fear at any time when the above points are visible; otherwise vessels should pass outside both Os Farilhões and Ilha Berlenga, giving them a wide berth.

caution is necessary in navigating on this part of the coast in thick weather, in order to avoid running on these isles, as they lie so far from the land and the depths around would hardly give warning in time to clear them.

In thick weather Peninsula de Peniche appears like an island, and has been mistaken for Ilha Berlenga. If Ilha Berlenga is seen, probably also As Estelas, and Os Farilhões will be visible; the breadth of the passage between Ilha Berlenga and the peninsula is much greater than the apparent opening eastward of the peninsula. Carvoeiro lighthouse is on the extremity of the cape, and its base about 90 feet ($27^{m}4$) above the sea, while the base of Ilha Berlenga lighthouse is about 300 feet ($91^{m}4$) above the sea.

If bound to Lisbon, after passing Ilha Berlenga, steer for a position off Cabo da Roca.

Fishing. Caution. Nets are laid at 4½ to 7 cables off the anchorage on the southern side of Peninsula de Peniche, and at about 1½ cables south-eastward of Ilha Berlenga.

Trawlers are found, at times, on the Route from the Channel to Lisbon on the following grounds:—

W. by S. from the south-west point of Belle Isle, working in a N.N.E. and S.S.W. direction; also at about 15 miles N.N.E. of Punta de la Estaca, working in an E.S.E. and W.N.W. direction; also from 6 to 8 miles off shore, between Rio de Arosa and Rio de Pontevedra; and, further south, at about 15 miles W. by N. from the mouth of the Rio Douro, working in a northerly and southerly direction.

(3) To Gibraltar.—From the Channel, the directions are the same as for Lisbon, *see* (2) above, as far as Cabo Finisterre. From Cabo Finisterre the course is parallel to the coasts of Spain and Portugal, at a distance from them that may gradually be closed, when advancing to the southward, from that at which Finisterre has been passed; but passing outside the Ilha Berlenga giving them a wide berth at night or in thick weather, and guarding against the indraught of the Tagus with the flood tide, when between Cabo da Roca and Cabo Espichel and abreast of the river mouth.

Cape St. Vincent may be rounded at a distance of 2 miles; care is, however, necessary when in the vicinity of this cape, as the currents generally set strong along the land, and have a tendency towards the cape. After passing Cape St. Vincent steer direct for the Strait of Gibraltar.

Fog.—Dense fogs are frequent at all seasons in the vicinity of Cape St. Vincent.

Note.—A vessel approaching the Strait of Gibraltar in thick weather may assure her safety by sounding. With clear weather there is no difficulty, as no shoal lies more than 4 miles from the land; but with thick weather caution is necessary, the currents, tidal streams and eddies between Cape St. Vincent and Isla de Tarifa being very variable. Cape Spartel is safe to approach.

In going through the Strait of Gibraltar, keep in mid-channel, as the current is nearly always setting to the eastward there. Along the shores, tidal streams are developed which run west with a rising tide and east with a falling tide. The easterly current in the middle is rarly overcome by the westerly stream, but during easterly winds and calms, it is always retarded, and occasionally reversed.

Tunny Fishing. CAUTION. During certain seasons of the year, fishing nets, of large size and great strength, are moored in various localities, for the purpose of catching tunny; they are sometimes more than 2 miles from the shore. During the summer season, between Baia de Lagos and the Rio Guadiana, these nets extend in places off-shore as much as 4 miles and more.

Tunny nets are continuous from their most seaward positions to the shore; vessels cannot navigate inside them and they should, therefore, be carefully avoided. The fishing season varies somewhat in different parts. On the coast of Spain, Africa, and the Islas Baleares, under Spanish jurisdiction, the season extends from 1st February to 30th October.

At the tunny fisheries established off the coasts of Spain and Africa, each tunny net, when submerged, will be distinguished by flags or lights, details of which will be found in the Pilot of the coast concerned.

(4) To CASABLANCA.—Follow (3) above as far as Cape St. Vincent, from which point proceed direct to destination.

Distances from Bishop rock by the above routes are:—Cadiz, 928 miles; Casablanca, 1,006 miles; El Ferrol, 397 miles; Gibraltar, 982 miles; Lisbon, 706 miles; Oporto, 546 miles; Vigo, 490 miles.

The Routes from Gibraltar into the Mediterranean are given in Section B, Part II, Chapter II.

Route 47. Bishop rock to ports on the West Coast of Africa

Take the Route 44 (4) given above to Islas Canarias, and thence steer as directly as possible to the port desired.

From Sierra Leone, after rounding Shoals of St. Ann, keep along the coast as far as Cape Palmas, and thence go direct.

During December, January and February (Harmattan season), it is advisable, when between Lagos and Cape Formosa, to follow the coast between Lagos and a point some 25 to 30 miles eastward.

Distances from Bishop rock are:—To Accra, 3,574 miles; Banana Creek (Congo R.), 4,470 miles; Bathurst, 2,284 miles; Conakry, 2,635 miles; Dakar, 2,196 miles; Douala (Cameroons), 4,166 miles; Lagos, 3,794 miles; Lobito (Angola), 4,755 miles; Sierra Leone, 2,687 miles; Takoradi, 3,475 miles.

Route 48. Bishop rock to Cape Town and to Cape of Good Hope

(a) Via Islas Canarias direct.—Take Route 44 (4) given above to the Islas Canarias; thence proceed to a position in lat. 10° 40′ N., long. 17° 40′ W., and thence direct to Cape Town, either on a Rhumb line or Great Circle track.

An alternative route, after passing Sierra Leone, is to coast along Africa as far as Cape Palmas and then steer for the Cape, crossing the equator in about long. 2° W. and curving in towards the coast, which enables a vessel to call at the Congo or at Baia de Luanda for coal. The distance by this route is about 6,000 miles.

Some shipping lines use the following route: After leaving the English channel and passing Ushant at a distance of 30 miles, course is shaped to pass 50 miles westward of Cabo Finisterre, between Teneriffe and Gran Canaria islands, and at least 60 miles from Cap Blanc, Cap Vert and the Bijagos (Bijouga) breakers, crossing the equator in long. 10° W., whence a direct course is shaped for Green point, Cape Town; or if not calling at Cape Town, and bound to Australasian ports, to pass 50 miles westward of the Cape of Good Hope, and thence as in routes from Cape Town given in Part III, Chapter III.

Navigation Note.—When approaching Cape Town it is advisable, when circumstances permit, to close the land off Great Paternoster point (*Lat. 32° 45′ S., Long. 17° 52′ E.*), and to pass southward between the land and both Dassen island and Robben island. By so doing, assistance will be received from the southward-setting counter-current, which sets along the coast at this point; while the main current, setting northward at a little distance westward of these two islands will be avoided. The direction and strength of the currents experienced when approaching Cape Town from northward or westward are, however, stated to be subject to much variation, and an inset into Table bay and towards the coast northward of it as far as Paternoster point is sometimes experienced.

(b) Via Madeira.—Take Route 44 (3) given above to Madeira; thence proceed by Rhumb lines to a position in lat. 10° 40′ N., long. 17° 40′ W., and thence to Cape Town, either on a Rhumb line or Great Circle track.

(i) If calling at St. Helena, *en route*, take the Rhumb line to it from lat. 10° 40′ N., long. 17° 40′ W., and from St. Helena to Cape Town a Great Circle.

(ii) If calling at Ascension, *en route*, take the Rhumb line to it from lat. 10° 40′ N., long. 17° 40′ W., and from Ascension to Cape Town a Great Circle.

(iii) If calling at both Ascension and St. Helena, the Great Circle track from Ascension to Cape Town passes about 50 miles westward of St. Helena, which is distant 703 miles from Ascension. There is no material difference in the total distance. The course is direct between the two islands.

(c) To the Cape of Good Hope.—Follow any of the above routes, adjusting the final course to make a point about 10 miles south of the Cape, if bound to ports in the Indian ocean other than Australasian; in the latter case proceed as in the third paragraph of (a) above.

For continuation to the Indian ocean, see Section B, Part III., Chapter III.

Distances from Bishop rock are:—Ascension, 3,554 miles; St. Helena, 4,162 miles (Ascension to St. Helena 703 miles); Cape Town by (a), 5,784 miles; (b), 5,819 miles; (b) (i), 5,858 miles; (b) (ii), 5,950 miles; (b) (iii), 5,953 miles. Cape of Good Hope by (a), 5,812 miles, to a point 10 miles south of the Cape.

Route 49.—*Spare.*

Route 50.—*Spare.*

Route 51.—*Spare.*

(iii) ROUTES FROM THE BAY OF BISCAY.

See Bay of Biscay Pilot, and General Remarks at the beginning of this chapter.

Route 52. Pauillac (Bordeaux) to Greenland and Hudson bay

Proceed as direct as prudent navigation will allow to pass at least 10 miles south-westward of Chaussée de Sein and thence by Great Circle to 75 miles south of Cape Farewell. Thence continue as in Route 2 (2).

Distance from Pauillac to Cape Farewell, 1,752 miles; to Churchill harbour, 3,362 miles; to Disko bugt (Godhavn), 2,523 miles; to Ivigtut, 1,992 miles.

Route 53. Pauillac to Gulf of St. Lawrence. *See* Caution after Route 55.

(a) April 11th to May 15th (inclusive), or until the Cape Race route is clear of ice.—Follow the Great Circle track to lat. 45° 55′ N., long. 50° 00′ W., and thence continue as directly as navigation permits, through Cabot strait to destination.

See Section D. Part I. Index on pages 340 and 341.

(b) May 16th to opening of Striat of Belle Isle, or November 30th when not using Strait of Belle Isle.—Follow a Great Circle track to a position 10 miles south of Cape Race, and thence through Cabot strait to destination.

(c) From opening of Strait of Belle Isle to November 14th.—Follow a Great Circle track to a position 7 miles south of Belle Isle, and thence through the strait to destination.

Distance from Pauillac (Bordeaux) to Montreal by (a), 3,134 miles; by (b), 3,119 miles; by (c), 3,032 miles.

Route 54. Pauillac (Bordeaux) to Halifax.—*See* Caution under Route 55.

(a) February 15th to April 10th (inclusive).—Follow the Great Circle track to lat. 43° 00′ N., long. 50° 00′ W., and thence continue on Rhumb line tracks to Halifax, passing not less than 40 miles south of Sable island.

(b) April 11th to May 15th (inclusive) and from December 1st to February 14th.—Follow the Great Circle track to lat. 45° 55′ N., long. 50° 00′ W., thence continue by the direct Rhumb line track to Halifax, passing about 60 miles north of Sable island.

(c) May 16th to November 30th (inclusive).—Follow the Great Circle track to a position 10 miles south of Cape Race, and thence continue by direct Rhumb line track to Halifax.

Distance from Pauillac to Halifax by (a), 2,712 miles; by (b), 2,626 miles; by (c), 2,624 miles.

Route 55. Pauillac (Bordeaux) to Boston or New York.—*See* Caution at the end of this route.

(a) Route to be followed when the " Extra Southern Lane Route " is brought into operation (that is when necessity arises).—Follow the Great Circle track to lat. 40° 30′ N., long. 47° 00′ W., and then continue on Rhumb line tracks to Boston, or to New York, passing close southward of Nantucket light vessel.

(b) April 11th to June 30th (inclusive), except when ice conditions necessitate the use of (a) above.—Follow the Great Circle track to lat. 41° 30′ N., long. 47° 00′ W., and then continue by Rhumb line tracks to Boston light vessel, or to New York, passing close southward of the Nantucket light vessel.

(c) July 1st to April 10th (inclusive), except when ice conditions necessitate the use of (b) above.—Take the Great Circle track to lat. 43° 00′ N., long. 50° 00′ W., and then continue by Rhumb line tracks to Boston light vessel or to New York, passing close southward of the Nanticket light vessel.

Distances from Pauillac by Routes (a), (b), and (c) above are:—To Boston light vessel: (a), 3,109 miles; (b), 3,072 miles; (c), 3,015 miles. To New York (Ambrose light vessel): (a), 3,260 miles; (b), 3,230 miles; (c), 3,183 miles.

Note.—The Great Circle tracks described in Routes 53, 54 and 55 above start at the entrance to Grande Passe de L'Ouest, La Gironde.

CAUTION. All the transatlantic routes described in Routes 53, 54, and 55 above, cross the east-going North Atlantic Lane Routes appropriate to the season.

Route 56. Pauillac (Bordeaux) to Gulf of Mexico, to Ports in Caribbean Sea, and to the West Indian Islands

(a) Via Providence Channels.—Follow the Great Circle track direct to lat. 25° 50′ N., long. 77° 00′ W. (in the entrance to North-east Providence channel); thence proceed through Providence channel and Florida strait to destination.

(b) Via Windward passage.—Follow the Great Circle track direct to lat. 21° 35′ N., long. 71° 10′ W., in the entrance to Turk's Island passage, and thence continue by Rhumb line tracks to destination.

(c) Via Mona passage.—Follow the Great Circle direct to a position about 12 miles north-north-west of Mona island, (*Lat. 18° 20′ N., Long. 68° 00′ W.*), and continue thence by Rhumb lines to destination.

(d) Via Sombrero Island passage.—Follow the Great Circle track to lat. 36° 00′ N., long. 39° 00′ W., and thence take a second Great Circle track to a position in the middle of Sombrero Island passage (*Lat. 18° 35′ N., Long. 63° 50′ W.*). From this point proceed by Rhumb lines to destination.

(e) Low-powered Ships.—Alternative routes to Providence channel, Windward passage, and Mona passage.—Follow the Great Circle track to lat. 36° 00′ N., long. 37° 00′ W., and thence continue by Great Circle, or Rhumb line to North-east Providence channel, to Turk's Island passage, or to Mona passage.

(f) Low-powered Ships.—Second alternative route to (a), (b), (c), or (d), above.—First proceed by Rhumb line to a position 40 miles north-west of Cabo Ortegal; thence continue by Rhumb lines, through lat. 36° 40′ N., long. 24° 45′ W., to lat. 30° 00′ N., long. 45° 30′ W.; thence continue direct to either North-east Providence channel, Windward passage, Mona passage, or Sombrero Island passage.

(g) To Windward Islands, and to Curaçao.—Take the Great Circle track to Barbados, passing close northward of São Miguel, Arquipélago dos Açôres; thence proceed to destination as directly as navigation will allow.

Distances from Pauillac (Bordeaux) are:— To Barbados, via (g), 3,569 miles; to Curaçao, via (d), 3,998 miles; via (g), 4,072 miles; to Mona passage, via (c), 3,685 miles; via (e), 3,691 miles; via (f), 3,750 miles; to N.E. Providence channel, via (a), 3,765 miles; via (e), 3,871 miles; via (f), 4,023 miles; to Sombrero Island passage, via (d), 3,501 miles; via (f), 3,548 miles; to Trinidad, via (g), 3,761 miles; to Turk's Island passage, via (b), 3,684 miles; via (e), 3,723 miles; via (f), 3,811 miles.

For continuation of the above routes to ports in the Gulf of Mexico, and in the Caribbean sea, see Routes 88, 89, 90, 91 *and* 92.

Route 57. *Reserved as spare.*

(*iv*) ROUTES FROM PORTS IN SPAIN (VIGO) AND PORTUGAL (LISBON).

See West Coast of Spain and Portugal Pilot.

Route 58. Vigo to Greenland and Hudson bay.—*See Arctic Pilot, Vol. II.*

Proceed on the Great Circle track to a position about 75 miles south of Cape Farewell, and thence continue as direct as navigation will allow to destination. *See* caution at the end of Route 2.

Distances from Vigo to Cape Farewell, 1,636 miles; to Churchill harbour, 3,246 miles; to Disko bugt (Godhavn), 2,405 miles; to Ivigtut, 1,876 miles.

Route 59. Vigo to the English channel.

Steer to the westward to pick up the track laid down in Route 46 (2), and follow it in the reverse direction from that there given.

See Caution under Route 65.

Distance from Vigo to Bishop rock, 490 miles. *See* Tables I. and II. on page 45.

Route 60. Vigo to Halifax or New York

(a) Uusal track.—From the entrance to Vigo, steer on a Great Circle to pick up the tracks given under Routes 78 and 79, according to season, at the point where they cut long. 30° 00′ W., and follow them to their respective destinations.

LOW POWERED STEAMERS TO NEW YORK

(b) May to September.—Follow the Great Circle to lat. 36° 00′ N., long. 35° 00′ W.; thence proceed on a Rhumb line (parallel sailing) to lat. 36° 00′ N., long. 65° 00′ W., and thence to destination.

(*c*) *October to April.*—Take a Rhumb line to lat. 33° 15′ N., long. 20° 00′ W.; thence steer on another Rhumb line (parallel sailing) to lat. 33° 15′ N., long. 65° 00′ W., and thence continue on Rhumb lines, first to lat. 35° 00′ N., long. 70° 00′ W., and thence to destination.

Distances from Vigo are:—To Halifax by (a), April 11th to June 30th, 2,488 miles; July 1st to April 10th, 2,451 miles. To New York (Ambrose L.V.), by (a), April 11th to June 30th, 2,939 miles; July 1st to April 10th, 2,915 miles; by (b), 3,185 miles; by (c), 3,637 miles.

Route 61. Vigo to Chesapeake bay (entrance)

(*a*) *Usual track.*—Steer on a Great Circle to lat. 38° 50′ N., long. 31° 00′ W., and thence on a second Great Circle to destination.

LOW POWERED STEAMERS

(*b*) *May to September.*—Follow a Great Circle to lat. 36° 00′ N., long. 35° 00′ W., thence on a Rhumb line to destination.

(*c*) *October to April.*—Steer on a Rhumb lines first to lat. 35° 15′ N., long. 20° 00′ W., thence to lat. 33° 15′ N., long. 65° 00′ W. (parallel sailing), thence on a Rhumb line to destination.

Distance from Vigo to Chesapeake bay by (a), 3,140 miles; by (b), 3,258 miles; by (c), 3,607 miles.

Route 62. Vigo to Gulf of Mexico.

(*a*) *By Providence channels.*—Proceed on a Great Circle track to lat. 36° 00′ N., long. 35° 00′ W., passing between Terceira and São Miguel, Arquipélago dos Açôres, and thence by a second Great Circle, lat. 25° 50′ N., long. 77° 00′ W., in the entrance to North-east Providence channel, and thence continue to destination. *See* Route 88.

(*b*) *By Windward passage.*—Proceed on a Great Circle track to lat. 36° 40′ N., long. 24° 45′ W., and thence on a second Great Circle to lat. 30° 00′ N., long. 45° 30′ W.; thence continue by Rhumb line to lat. 21° 35′ N., long. 71° 10′ W., in Turk's Island passage, and thence through the Windward passage to destination. *See* Route 89.

Distance from Vigo to N.E. Providence channel, 3,504 miles; to Turk's Island passage, 3,395 miles.

For continuation of above routes into the Gulf of Mexico see Routes 88 *and* 89.

Route 63. Vigo to Colon (Panama Canal)

(*a*) *By Mona passage.*—Take the Great Circle track to lat. 38° 50′ N., long. 31° 00′ W. and thence a second Great Circle to Mona island.

(*b*) *By Sombrero Island passage.*—Follow the Great Circle track to lat. 36° 40′ N., long. 24° 45′ W., and proceed thence by a second Great Circle to lat. 18° 35′ N., long. 63° 50′ W., in the middle of Sombrero Island passage, and thence continue as direct as navigation will allow to destination.

Distance from Vigo to Colon by (a), 4,162 miles; by (b), 4,237 miles; to Mona passage by (a), 3,287 miles; to Sombrero Island passage by (b), 3,127 miles.

For continuation of the above routes to other destinations in the Caribbean see Routes 90 *and* 91.

Route 64. Vigo to Lisbon and to Gibraltar

Proceed as directly as possible along the coast. *See* also Route 46 (3).

Distances from Vigo to Lisbon, 240 miles; to Gibraltar, 520 miles.

Route 65. Lisbon to Vigo, or to the channel

Proceed as directly as possible along the coast to Vigo. If bound to the Channel steer so as to clear Cabo Villano by not less than 30 miles. *See Cautions* under Route 46.

CAUTION. Steam vessels approaching the English channel from the southward often close Ushant to make it and ascertain their position before proceeding up channel, but the gain in distance by steering from off Cabo Villano to a point 10 miles westward of Ushant, instead of 40 miles westward, is, if making the Start, only 5 miles; or if making Portland Bill, 8 miles, in a distance of 530 miles.

Mariners approaching Ushant (*Lat.* 48° 28′ *N., Long.* 5° 08′ *W.*) must guard against the danger of being set eastward of their reckoning, and should use the greatest caution in passing it. The island is surrounded by dangers; rocks are numerous and far from the land; fogs and thick weather are common, the tidal streams are strong, and the extent of their influence seawards undetermined; no dependence can be placed on seeing the lights, although they are very powerful, or hearing the fog signals. In thick weather the island should be given a wide berth, and continuous sounding resorted to and a depth maintained exceeding 60 fathoms (109^{m} 7), allowing for the rise of the tide.

In settled fine weather Ushant may, however, be rounded at a distance of about 10 miles.

Distance from Lisbon to Vigo, 240 miles; to Bishop rock, 706 miles. *See* Tables on page 45.

Route 66. Lisbon to Hudson bay

Follow the Great Circle track to lat. 61° 00′ N., long. 64° 55′ W., in the middle of Hudson strait, and thence continue as directly as prudent navigation will allow to destination.

Distance from Lisbon to Churchill harbour, 3,387 miles; to Hudson strait, 2,444 miles.

Route 67. Lisbon to St. John's, Newfoundland

Follow the Great Circle track direct.

Distance from Lisbon to St. John's, 1,954 miles.

Route 68. Lisbon to Halifax, New York or Chesapeake bay

(*a*) *Usual track.*—Steer westward to pick up the Great Circle tracks from Gibraltar, Routes 78 and 79, at long. 15° 00′ W. The distances from Lisbon to above ports are all about 215 miles less than from Gibraltar.

LOW-POWERED STEAMERS TO UNITED STATES PORTS

(*b*) *May to September.*—Proceed by Rhumb line tracks to lat. 36° 00′ N., lat. 20° 00′ W., thence (by parallel sailing) to lat. 36° 00′ N., long. 65° 00′ W., and thence to destination. When bound for Halifax leave the second Rhumb line at lat. 36° 00′ N., long. 45° 00′ W., and proceed to Halifax, passing not less than 40 miles south of Sable island.

(*c*) *October to April.*—Proceed by Rhumb line tracks to lat. 33° 15′ N., long. 20° 00′ W., thence (by parallel sailing) to lat. 33° 00′ N., long. 65° 00′ W., and thence to destination.

Distances from Lisbon are:—To Chesapeake bay (entrance), by (b), 3,302 miles; by (c), 3,506 miles; to Halifax, by (a), April 11th to June 30th, 2,511 miles; July 1st to April 10th, 2,484 miles; by (b), 2,760 miles; to New York (Ambrose light vessel), by (a), April 11th to June 30th, 2,968 miles; July 1st to April 10th, 2,954 miles; by (b), 3,329 miles; by (c), 3,548 miles.

Route 69. Lisbon to Gulf of Mexico

(*a*) *By Providence Channels.*—Take the Great Circle track direct, passing about 10 miles north of Arquipélago dos Açôres.

(*b*) *By Windward passage.*—Follow the Great Circle track to lat. 36° 40′ N., long. 24° 45′ W. (south-eastward of Ilha de Santa Maria, Arquipélago dos Açôres); thence take a second Great Circle to lat. 21° 35′ N., long. 71° 10′ W. (Turk's Island passage), and thence proceed as directly as navigation permits through the Windward passage to destination.

Distance from Lisbon to N.E. Providence channel, 3,445 miles; to Turk's Island passage, 3,333 miles.

For continuation of these routes into the Gulf of Mexico, see Routes 88 *and* 89.

Route 70. Lisbon to Colon (Panama Canal)

(a) By Mona passage.—Proceed on the Great Circle track to lat. 18° 20′ N., long. 68° 00′ W., and thence as direct as navigation will allow, through Mona passage, to Colon.

(b) By Sombrero Island passage.—Proceed on the Great Circle track to lat. 18° 35′ N., long. 63° 50′ W., and thence as direct as navigation will allow, through Sombrero Island passage to Colon.

Distance from Lisbon to Colon, (a), 4,152 miles; (b), 4,163 miles; to Mona passage, 3,277 miles; to Sombrero Island passage, 3,053 miles.

For continuation of these routes through the Caribbean sea, see Routes 90 *and* 91.

Route 71. Lisbon to Rio Amazonas and to Madeira

Follow the Great Circle track direct to a position 10 miles north of Ponta Tijoca, at the entrance to Rio Para. The above track passes close to Madeira.

Distance from Lisbon to Madeira 528 miles; to Rio Para, 3,170 miles.

Route 72. Lisbon to Islas Canarias

Proceed as direct as navigation will allow.

Distance from Lisbon to Las Palmas, 709 miles.

For continuation of passages via Islas Canarias to ports on the east coast of South America, and to ports on the west coast of Africa, see Routes 113 *and* 114.

Route 73. Lisbon to Gibraltar

Proceed as directly as possible around the coast. *See* also Route 46 (3).

Distance from Lisbon to Gibraltar, 302 miles.

Route 74.—*Reserved as spare.*

(v) ROUTES FROM GIBRALTAR

Note.—For passages in the Mediterranean to and from Gibraltar *see* Section B, Part II., Chapter II.

CAUTION.—When bound westward through the Strait of Gibraltar attention should be paid to the tidal streams. The prevailing east-going current in the middle of the strait may be largely avoided by keeping close to either shore, preferably the Spanish; but the tide races which occur off many salient points on both shores should be avoided, especially by small ships. *See West Coast of Spain and Portugal Pilot.*

Route 75. Gibraltar to Reykjavik

Proceed as direct as navigation will allow to Cape St. Vincent and thence by Great Circle track to Reykjanes; thence continue as directly as navigation will allow to Reykjavik.

Distance from Gibraltar to Reykjavik, 1,921 miles.

See Cautions regarding magnetic compass and ice under Route 1.

Route 76. Gibraltar to Greenland and Hudson bay

(1) To HUDSON BAY.—Proceed as direct as navigation will allow to Cape St. Vincent, thence by Great Circle to lat. 61° 00′ N., long. 64° 55′ W., in the middle of the entrance to Hudson Strait, and thence as direct as prudent navigation will allow to Churchill harbour.

(2) To GREENLAND.—The Great Circle track mentioned above passes through a position in lat. 57° 35′ N., long. 44° 00′ W. (about 130 miles south of Cape Farewell); from thence steer as directly as prudent navigation will allow to Ivigtut or Disko bugt.

Distances from Gibraltar to Hudson strait, 2,714 miles; to Churchill harbour, 3,657 miles; to Disko bugt (Godhavn), 2,833 miles; to Ivigtut, 2,304 miles.

Route 77. Gibraltar to Gulf of St. Lawrence

Proceed as direct as navigation will allow to Cape St. Vincent; thence continue by Great Circle to lat. 45° 55′ N., long. 50° 00′ W., and thence, as directly as navigation permits, through Cabot strait to destination.

Distance from Gibraltar to Montreal, 3,185 miles.

Route 78. Gibraltar to Halifax

(a) April 11*th to June* 30*th (both days inclusive).*—After clearing the Straits, when off Cape St. Vincent, take a Great Circle track to lat. 41° 30′ N., long. 47° 00′ W.; thence on Rhumb line tracks to Halifax, passing not less than 40 miles southward of Sable island.

Note.—The Great Circle track crosses long. 15° W. in about lat. 38° 38′ N. (*see Route* 68) and long 30° W. in about lat. 41° 05′ N. (*see Route* 60).

(b) July 1*st to April* 10*th (both days inclusive).*—After clearing the Straits, when off Cape St. Vincent, take a Great Circle track to lat. 43° 00′ N., long. 50° 00′ W.; thence on Rhumb line tracks to Halifax, passing not less than 40 miles southward of Sable island.

Note.—The Great Circle track crosses long. 15° W. in about lat. 38° 50′ N. (*see Route* 68) and long. 30° W. in about lat. 42° 00′ N. (*see Route* 60).

(c) Low-powered Steamers. (All seasons).—After clearing the Straits, pick up the parallel of lat. 36° 00′ N., and steer along it to long. 45° 00′ W., and thence on a Rhumb line to destination.

Distance from Gibraltar to Halifax by (a), 2,728 miles; by (b), 2,708 miles; by (c), 2,920 miles.

Route 79. Gibraltar to Boston or New York

(a) April 11*th to June* 30*th (both days inclusive).*—After clearing the Straits, when off Cape St. Vincent, take a Great Circle track to lat. 41° 30′ N., long. 47° 00′ W.; thence to Boston light vessel, on a Rhumb line, or to a position close southward of Nantucket light vessel, and thence to New York.

Note.—The Great Circle track crosses long. 15° W. in about lat. 38° 38′ N. (*see Route* 68), and long. 30° W. in about lat. 41° 05′ N. (*see Route* 60).

(b) July 1*st to April* 10*th (both days inclusive).*—After clearing the Straits, when off Cape St. Vincent, take a Great Circle track to lat. 43° 00′ N., long. 50° 00′ W.; thence to Boston, or New York as in *(a)* above.

Note.—The Great Circle track crosses long. 15° W. in about lat. 38° 50′ N. (*see Route* 68) and long. 30° W. in about lat. 42° 00′ N. (*See Route* 60).

(c) Alternative route to New York (All seasons).—After clearing the Straits, take a direct Rhumb line track to lat. 39° 40′ N., long. 70° 00′ W., passing 20 miles southward of São Miguel, Arquipélago dos Açôres, and thence to New York.

LOW-POWERED STEAMERS (TO UNITED STATES PORTS)

(d) May to September.—After leaving the Straits, pick up the parallel of 36° 00′ N. and steer on it across the ocean to long. 65° 00′ W.; thence on a Rhumb line to destination.

(e) October to April.—On clearing the Straits, steer on a Rhumb line to lat. 33° 15′ N., long. 20° 00′ W., thence on the parallel of 33° 15′ N. to long. 65° 00′ W., thence to destination on a Rhumb line.

Distances from Gibraltar are:—To Charlestown by (d), 3,685 miles; by (e), 3,783 miles; to Chesapeake bay (entrance), by (d), 3,435 miles; by (e), 3,600 miles; to Boston light vessel, by (a), 3,027 miles; by (b), 3,010 miles; to New York (Ambrose L.V.), by (a), 3,185 miles; by (b), 3,178 miles; by (c), 3,267 miles; by (d), 3,362 miles; by (e), 3,643 miles.

Route 80. Gibraltar to Lisbon, Vigo or the Channel

Take the reverse track to that given in Route 46.

Note.—It is usual for northward bound steamers to follow the Portuguese coast and Spanish coast to Cabo Finisterre more closely than the southward bound traffic, and to pass Ushant also between 10 and 20 miles distant, according to weather conditions and current. *See* also Caution under Route 65.

Note.—The CAUTION as to the uncertainty of direction and speed of the easterly set across the Bay of Biscay, given under Route 46, and the consequent need for very careful navigation, especially in thick weather is, however, equally applicable to both northward and southward passages on this route.

Distances from Gibraltar to Bishop rock, 982 miles; to Lisbon, 302 miles; to Vigo, 520 miles.

Route 81. Gibraltar to Gulf of Mexico.—*see the Caution at the beginning of this sub-section on page.* 52

(*a*) *By Providence channels.*—After leaving the Straits, steer on the parallel of lat. 36° 00′ N. until reaching long. 35° 00′ W., and thence on Great Circle to Providence channels.

(*b*) *By Windward passage.*—After leaving the Straits, steer on the parallel of 36° 00′ N., until reaching long. 35° 00′ W. and thence on a Rhumb line to lat. 21° 35′ N., long. 71° 10′ W., in Turks' Island passage; thence proceed through Windward passage to destination.

Distance from Gibraltar to N.E. Providence channel, 3,671 miles; to Turk's Island passage, 3,536 miles.

For continuation of the above, see Routes 88 *and* 89.

Route 82. Gibraltar to Colon (Panama Canal)

(*a*) *By Mona passage.*—After clearing the Straits, follow the Great Circle track to lat. 18° 20′ N., long. 68° 00′ W. (12 miles NNW. of Mona island), and thence proceed as direct as navigation will allow, through Mona passage to Colon.

(*b*) *By Sombrero Island passage.*—After clearing the Straits, follow the Great Circle track to lat. 18° 35′ N., long. 63° 50′ W. (in middle of Sombrero Island passage), and thence proceed as direct as navigation will allow, through Sombrero Island passage to Colon.

Distance from Gibraltar to Colon by (a), 4,330 miles; by (b), 4,333 miles; to Mona passage, 3,452 miles; to Sombrero Island passage, 3,223 miles.

For continuation of the above to other Caribbean ports see Routes 90 *and* 91.

Route 83. Gibraltar to Barbados, Trinidad and Curaçao

After clearing the Straits follow the Great Circle track to lat. 13° 40′ N., long. 59° 00′ W., and thence proceed by Rhumb line tracks, as directly as navigation allows, to destination.

Note.—The route north of Guadeloupe shortens the passage to Curaçao by about 50 miles.

Distance from Gibraltar to Barbados (Carlisle Bay), 3,236 miles; to Curaçao (Santa Anna), 3,786 miles; to Trinidad (Port of Spain), 3,431 miles.

Route 84. Gibraltar to Madeira or Islas Canarias.

Having cleared the Strait (*see* Note at the beginning of this sub-section), take the direct Rhumb line track to either destination.

Distance from Gibraltar to Madeira, 611 miles; to Las Palmas, Islas Canarias, 700 miles.

For routes onward to Cape Town, and to ports on the West Coast of Africa, see Routes 106 *and* 114.

Route 85. Gibraltar to Rio Amazonas and South American ports

(1) To RIO AMAZONAS (Pará).—Follow the direct Great Circle track to a position 10 miles north of Ponta Tijoca at the entrance to Rio Pará, passing between Isla de Hierro and Isla de La Palma, in Islas Canarias.

(2) TO RECIFE, OR PORTS TO THE SOUTHWARD OF IT.—If not calling at the Islas Canarias, steer down the African coast, passing between it and Isla de Fuerteventura (Islas Canarias) to a position in lat. 17° 30′ N., long. 20° 00′ W., and thence direct, eastward of the Arquipélago de Cabo Verde, past St. Paul's rocks and Ilha de Fernando de Noronha, to destination. (*See* Route 113 (1) to (5) for passage from Islas Canarias, if calling at Las Palmas).

Distance from Gibraltar to Bahia Blanca, 5,571 miles; to Salvador (Baia), Pôrto do, 3,516 miles; to Recife, 3,131 miles; to Rio Amazonas, 3,228 miles; to Rio de Janeiro, 4,154 miles; to Rio de La Plata, 5,186 miles.

Route 86.—*Reserved as spare.*

Route 87.—*Reserved as spare.*

(vi) CONTINUATION OF TRANS-ATLANTIC ROUTES IN GULF OF MEXICO AND CARIBBEAN SEA

Route 88. Providence channels to New Orleans and other ports in the Gulf of Mexico.

General.—Directions for the navigation of Providence channels and Florida strait will be found in West Indies Pilot, Vol. III. It should be noted that North-east Providence channel is also known as "Hole-in-the-Wall passage," and that the Providence channels jointly are sometimes referred to as the Abaco passage.

From a position at its entrance in lat. 25° 50′ N., long. 77° 00′ W., it is 382 miles from N.E. Providence channel, to a position off the Dry Tortugas in lat. 24° 25′ N., long. 83° 00′ W. On reaching the southern end of Florida, off Miami, a route as closely inshore as safe navigation will permit should be taken, so as to be clear of the Gulf Stream, and to receive the benefit of the south-going stream inshore of it.

From the position off the Tortugas, proceed to all Gulf ports as directly as navigation permits. (*See* "Pilot Chart of the Central American Waters," published by the Hydrographic Office of the United States Navy Department, issued monthly).

Distances from the entrance to N.E. Providence channel in lat. 25° 50′ N., long. 77° 00′ W., are:—To Coatzacoalcos (Puerto Mexico), 1,127 miles; to Galveston, 1,082 miles; to Mobile, 855 miles; to New Orleans (entrance to S.W. pass), 308 miles; to Pensacola, 817 miles; to Tampico, 1,217 miles; to Vera Cruz, 1,179 miles.

See General remarks at the beginning of sub-section (iv) of Chapter III. on page 69.

Route 89. Turk's Island passage (lat. 21° 35′ N., long. 71° 10′ W.) and Windward passage to New Orleans and other ports in Gulf of Mexico and Caribbean sea. *See* General remarks at the beginning of Sub-section (iv), Chapter III., on page 69.

(1) To HABANA AND PORTS IN THE NORTHERN HALF OF THE GULF OF MEXICO.—Follow Rhumb line tracks, south of Great Inagua island, through the Old Bahama and Nicolas channels, to Habana; or crossing

the Florida strait and the Gulf Stream to lat. 24° 25′ N., long 83° 00′ W., off Dry Tortugas, and thence to destination as in Route 88. For the navigation of these channels, *see* West Indies Pilot, Vol. III.

(2) To PORTS IN THE SOUTHERN HALF OF THE GULF OF MEXICO.—Proceed through the Windward passage, south of Cuba, through the Yucatan channel, and thence as direct as prudent navigation will allow to destination.

(3) To PORTS IN THE CARIBBEAN SEA.—Pass through the Windward passage, and thence proceed as direct as prudent navigation will allow to destination. *See* West Indies Pilot, Vols. III and I.

Distances from Turk's Island passage (*Lat. 21° 35′ N., Long. 71° 10′ W.*) are:—By (1) above to Galveston, 1,419 miles; to Habana, 677 miles; to Mobile, 1,192 miles; to New Orleans (entrance to S.W. pass), 1,144 miles; to Pensacola, 1,154 miles. By (2), to Coatzacoalcos (Puerto Mexico), 1,430 miles; to Vera Cruz, 1,482 miles. By (3), to Belize (Br. Honduras), 1,030 miles; to Colon (Panama Canal), 902 miles; to Kingston (Jamaica), 408 miles.

Note.—To Tampico by (1) above is 1,535 miles; by (2), 1,543 miles.

Route 90.—Mona passage to ports in Caribbean sea

From a position in lat. 18° 20′ N., long. 68° 00′ W., 12 miles N.N.W. of Mona island, proceed by Rhumb lines as direct as navigation will permit.

Distance from Mona passage to Belize (Br. Honduras), 1,190 miles; to Colon (Panama Canal), 882 miles; to Curaçao (Santa Anna), 391 miles; to Kingston (Jamaica), 526 miles.

Route 91. Sombrero Island passage to ports in Caribbean sea.

From a position in lat. 18° 35′ N., long. 63° 50′ W., in the middle of Sombrero Island passage, steer as direct as navigation will permit on Rhumb line courses.

CAUTION. The current sets strongly to the westward, sometimes at 3 knots off Curaçao and across the narrow entrance of the harbour.

Distance from Sombrero Island passage to Belize (Br. Honduras), 1,428 miles; to Colon (Panama Canal), 1,089 miles; to Curaçao (Santa Anna), 510 miles; to Kingston (Jamaica), 764 miles.

Route 92. St. Vincent (Windward islands) to ports in Caribbean sea and in Gulf of Mexico. *See* General remarks at the beginning of Sub-section (iv) of Chapter III. on page 69.

Note.—The distance from Barbados to St. Vincent is 92 miles. *See* Routes 242, 243, 244 and 245.

(1) To PORTS IN CARIBBEAN SEA.—From lat. 13° 28′ N., long. 61° 10′ W., 5 miles north of Porter point, St. Vincent, proceed by Rhumb line, as direct as prudent navigation will allow.

(2) To HABANA AND PORTS IN NORTH OF GULF OF MEXICO.—From lat. 13° 28′ N., long. 61° 10′ W., 5 miles north of Porter point, St. Vincent, follow Rhumb line tracks, as direct as prudent navigation will allow, passing through Mona passage, and along Old Bahama and Nicolas channels to destination.

(3) To PORTS IN WEST AND SOUTH OF GULF OF MEXICO.—Follow Rhumb line tracks, as direct as prudent navigation will allow, passing north of Jamaica and through Yucatan channel, to destination. This can be used as an alternative route to New Orleans and Galveston, for which the total distances are increased by about 75 and 10 miles respectively.

Distances from St. Vincent are:—(1) Belize, 1,602 miles; Colon (Panama canal), 1,145 miles; Curaçao, 469 miles; Kingston (Jamaica), 953 miles. (2), Galveston, 2,121 miles; Habana, 1,379 miles; New Orleans (entrance to S.W. Pass), 1,846 miles. (3), Coatzacoalcos (Puerto Mexico), 2,055 miles; Tampico, 2,171 miles; Vera Cruz, 2,107 miles.

Route 93.—*Reserved as spare.*

(vii) ROUTES FROM CASABLANCA, MADEIRA, AND ISLAS CANARIAS

Route 94. Casablanca to Bishop rock

Take the reverse of Route 46 (4), noting the Caution and remarks under Route 65.

Distance from Casablanca to Bishop rock, 1,006 miles.

Route 95. Casablanca to New York

Follow Rhumb line tracks to a position, about 20 miles south of São Miguel, Arquipélago dos Açôres, thence to lat. 39° 40′ N., long. 70° 00′ W., and thence to New York (*See* Route 79 (c)).

Distance from Casablanca to New York, 3,175 miles.

Route 96. Casablanca to ports in Gulf of Mexico and Caribbean sea

(a) Via Providence channel.—Follow the Great Circle track direct to a position in the eastern entrance to North-east Providence channel in lat. 25° 50′ N., long. 77° 00′ W., and thence continue through Providence channels to destination. *See* Route 88.

(b) Via Windward passage.—Follow the Great Circle track to lat. 21° 35′ N., long. 31° 10′ W., in Turk's Island passage, and thence proceed to, and through, Windward passage to destination. *See* Route 89.

(c) Via Mona passage.—Proceed by Rhumb line to a position in lat. 32° 35′ N., long. 17° 00′ W., close south of Maderia, and thence continue on a Great Circle to lat. 18° 20′ N., long. 68° 00′ W., 12 miles N.N.W. of Mona island; thence continue through the Mona passage to destination. *See* Route 90.

(d) Via Sombrero Island passage.—Steer by Rhumb line to lat. 32° 35′ N., long. 17° 00′ W., close south of Madeira, and thence take the Great Circle track to lat. 18° 35′ N., long. 63° 50′ W., in the middle of Sombrero Island passage; thence pass through Sombrero Island passage to destination. *See* Route 91.

(e) Via Barbados.—Take the Great Circle track direct to Barbados, and thence continue by Route 92.

Distance from Casablanca to N.E. Providence channel, 3,581 miles; to Turk's Island passage, 3,408 miles; to Mona passage, 3,341 miles; to Sombrero Island passage, 3,124 miles; to Barbados, 3,093 miles.

Route 97. Casablanca to Rio Amazonas, to Recife, and to South American ports south of Recife.

Follow the tracks given in Route 85, Gibraltar to South American ports. The distances are about 190 miles less than those given from Gibraltar.

Route 98. Casablanca to Madeira, or Islas Canarias

In each case take the Rhumb line track direct.

Distance from Casablanca to Madeira, 472 miles; to Las Palmas, 526 miles.

For routes onward to Cape Town and to ports on the West Coast of Africa, see Routes 106 *and* 114.

Route 99. Madeira to Bishop rock

Take the Great Circle track direct; the reverse of Route 44 (3). *See* Cautions under Route 65.

Distance from Madeira to Bishop Rock, 1,142 miles.

See Section D. Part I. Index on pages 340 and 341.

Route 100. Madeira to Gibraltar, Vigo, or Lisbon

Take a direct Rhumb line track to each place.

Distances from Madeira to Gibraltar, 611 miles; to Vigo, 702 miles; to Lisbon, 528 miles.

Route 101. Madeira to Arquiplaégo dos Açôres

Proceed by Rhumb line tracks as directly as navigation permits.

Distance from Madeira to Horta, 676 miles; to Ponta Delgada (São Miguel), 529 miles.

Route 102. Madeira to N.E. Providence channel and Gulf of Mexico

Follow the Great Circle track to lat. 25° 50′ N., long. 77° 00′ W., in the entrance to N.E. Providence channel, and thence continue as in Route 88.

Distance from Madeira to N.E. Providence channel, 3,193 miles.

Route 103. Madeira to Colon (Panama Canal)

(a) By Mona passage.—Follow the Great Circle track to a position in lat. 18° 20′ N., long. 68° 00′ W., 12 miles N.N.W. of Mona island, and thence proceed as directly as navigation will allow through Mona passage to Colon.

(b) By Sombrero Island passage.—Follow the Great Circle track to a position in lat. 18° 35′ N. long. 63° 50′ W., in the middle of Sombrero Island passage, and thence proceed as directly as navigation will allow through Sombrero Island passage to destination.

Distances from Madeira to Colon, by (a), 3,750 miles; by (b), 3,740 miles; to Mona passage, 2,868 miles; to Sombrero Island passage, 2,651 miles.

Note.—To destinations in the Caribbean sea other than Colon, *see* Routes 90 and 91.

Route 104. Madeira to Rio Amazonas

Follow the Great Circle track direct to a position 10 miles north of Ponta Tijoca, at the entrance to Rio Para.

Distance from Madeira to the above point is 2,646 miles.

Route 105. Madeira to Sao Vicente (Arquipélago de C. Verde) and to ports in South America

Follow the Great Circle track from Madeira to Recife, which passes nearly through São Vicente, Arquipélago de Cabo Verde, which is thus a convenient port of call for re-fuelling, if required. Off Recife, the track may be picked up onward to the various east coast ports to the southward of it. If not calling at São Vicente, pass between that island and Ilha de São Antas, so as to get the full effect of the south-going current in the channel.

Distances from Madeira are:—To Bahia Blanca, 5,097 miles; to Recife, 2,651 miles; to Rio de Janeiro, 3,720 miles; to Rio de La Plata (entrance), 4,712 miles; to Salvador (Baia), Pôrto de, 3,035 miles; to Santos, Pôrto de, 3,907 miles; to São Vicente, 1,041 miles.

See Route 123 and remarks at the beginning of Sub-section (vi) of Chapter III. on page 72.

Route 106. Madeira to Islas Canarias, and to ports on West Coast of Africa and Cape Town

(1) To Islas Canarias.—Follow Rhumb line courses, as direct as prudent navigation will allow, passing Ilhéus Selvagem on either side, but at not less than 20 miles distance, these islands being unlighted, and surrounded on nearly all sides by dangerous reefs.

(2) To ports on the West Coast of Africa.—Proceed, in all cases, as directly as prudent navigation will allow. If the passage is made via Las Palmas, *see* Route 114.

(3) To Cape Town.—Proceed as directly as prudent navigation will allow, following the routes (as far as applicable) given under Route 48 (b), and navigational note under Route 48 (a).

Distances from Madeira are:—To Accra, 2,467 miles; to Banana Creek (Congo river), 3,363 miles; to Bathurst, 1,177 miles; to Cape Town, 4,677 miles; to Conakry, 1,528 miles; to Dakar, 1,088 miles; to Douala, 3,059 miles; to Lagos, 2,687 miles; to Las Palmas (Puerto de la Luz), 290 miles; to Lobito, 3,643 miles; to Sierra Leone, 1,580 miles; to Takoradi, 2,368 miles.

Route 107. Islas Canarias (Las Palmas) (Puerto de la Luz) to Bishop rock and intermediate ports and to the English channel

(1) To Casablanca.—Take the reverse of Route 98.

(2) To Gibraltar.—Take the reverse of Route 84, noting the remarks on approaching Gibraltar given in Route 46.

(3) To Lisbon.—Take the reverse of Route 72.

(4) To Vigo.—Proceed by Rhumb line track direct.

(5) To Bishop rock and English channel.—Take the reverse of Route 44 (4). *See* remarks in Route 106 (1) regarding Ilhéus Salvagem and caution on the approach to English Channel under Route 65.

Distance from Las Palmas to Bishop rock, 1,365 miles; to Casablanca, 526 miles; to Gibraltar, 700 miles; to Lisbon, 709 miles; to Vigo, 910 miles.

Route 108. Islas Canarias to Arquipélago dos Açôres

Proceed as direct as navigation will allow.

Distance from Las Palmas to Horta, 904 miles.

Route 109. Islas Canarias to Providence channels and Gulf of Mexico

Proceed by Rhumb line tracks to lat. 29° 00′ N., long. 18° 00′ W., and thence continue on a Great Circle track to lat. 25° 50′ N., long. 77° 00′ W., in the entrance to North-east Providence channel; thence proceed through Providence channels as directly as navigation will allow. *See* Route 88.

Distance from Las Palmas to N.E. Providence channel, 3,271 miles.

Route 110. Islas Canarias to Colon (Panama Canal)

(a) By Mona passage.—Take Rhumb line tracks to lat. 28° 00′ N., long. 18° 00′ W., and thence continue on a Great Circle track to lat. 18° 20′ N., long. 68° 00′ W., 12 miles N.N.W. of Mona island; thence proceed through Mona passage to Colon as directly as navigation will allow.

(b) By Sombrero Island passage.—Proceed by Rhumb line tracks to lat. 28° 00′ N., long. 18° 00′ W., and thence continue by Great Circle track to lat. 18° 35′ N., long. 63° 50′ W., in the middle of Sombrero Island passage; thence proceed as directly as prudent navigation will allow, through Sombrero Island passage to Colon.

Distance from Las Palmas to Colon by (a), 3,821 miles; by (b), 3,802 miles; to Mona passage, 2,939 miles; to Sombrero Island passage, 2,713 miles.

Route 111. Islas Canarias to Rio Amazonas

Proceed on a Great Circle track direct to a position 10 miles north of Ponta Tijoca, at the entrance to Rio Para.

Distance from Las Palmas to Rio Amazonas, 2,546 miles.

Route 112. Islas Canarias to Sao Vicente (Arquipélago de Cabo Verde)

Proceed by direct Rhumb line, or by Great Circle track as preferred.

Distance from Las Palmas to São Vicente, 867 miles.

Route 113. Islas Canarias to ports on East Coast of South America

(1) To Recife.—Follow the Great Circle track from Las Palmas to Recife, which passes close to the eastward of São Tiago (St. Jago), and the whole Arquipélago de Cabo Verde; thence steer to pass 45 miles westward of St. Paul rocks, and about 5 miles westward of Ilha de Fernando de Noronha.

caution. A good look-out is necessary on passing the above rocks and island, as the equatorial current sets to the W.N.W. past them, at from 1 to 2 knots. Make the mainland of South America on a bearing of 270°, 10 miles off Ponta de Olinda, and steer thence into Recife.

(2) To Pôrto do Salvador (Baia).—Proceed as in (1), above; and, having made the land off Recife, steer towards Pôrto do Salvador (Baia), keeping at about 20 miles distance from the coast, so as to keep out of the inshore current, usually setting to the northward. Steer so as to pass southward of Banco de S. Antonio; the channel to the northward being reported dangerous.

(3) To Rio de Janeiro, and Pôrto de Santos.—The direct track from Las Palmas to Rio de Janeiro passes 50 miles eastward of the Arquipélago de Cabo Verde, and about 40 miles eastward of St. Paul rocks. *See* Note in (1), above, as to equatorial current.

Pass 20 miles eastward of Arquipélago dos Abrolhas, and the same distance off Cabo de S. Tome, in order to avoid off-lying dangers, and also to receive full benefit of the south-going Brazil current. There is usually a north-going current nearer the coast.

After passing Cabo de S. Tome, steer to a point 3 miles south of Cabo Frio; thence to a point one mile south of Ilhas Maricas and thence, westward of Ilha do Pai, into Rio de Janerio harbour.

Proceeding thence to Pôrto de Santos, of conditions are favourable, pass to the westward of Cotunduba island, and of Palmas island, to a position 2 miles south of Ilhas Tijucas. Thence continue to a position 3 miles south of Ponta do Boi; and thence to 1 mile south of Ilha da Moela, passing northward of Arquipélago de Alcatrazes.

(4) To Rio de La Plata (entrance).—Follow Route (2), above, to the position 20 miles eastward of Cabo de S. Tome, and from this point steer to a position 10 miles eastward of Cabo Polonio (*Lat. 34° 25′ S., Long. 53° 46′ W.*), and thence to destination, keeping as close to the land as safe navigation permits. If in daylight (but not otherwise), pass inside of Ilha de Lobos, in order to avoid, as much as possible, the east-going stream. There is here often a counter-current, setting to the westward.

(5) To Bahia Blanca.—Follow Route (3), above, to the position 20 miles eastward of Cabo de S. Tome, and from this point, steer to a position 10 miles eastward of Cabo Corrientes (*Lat. 38° 03′ S., Long. 57° 29′ W.*), and from thence into harbour, as directly as navigation permits.

Note.—For the inshore navigation of all the above routes, the latest charts, and South America Pilot, Part I., should be consulted.

See also General Remarks at the beginning of Sub-section (vi), Chapter III. on page 72.

Distance from Las Palmas (Puerto de la Luz), Islas Canarias, to Bahia Blanca, 4,900 miles; to Recife, 2,456 miles; to Rio de Janeiro, 3523 miles; to Rio de La Plata (entrance), 4,515 miles; to Santos, Pôrto de, 3,710 miles; to Salvador (Baia), Pôrto do, 2,841 miles.

Route 114. Islas Canarias to ports on West Coast of Africa, and to Cape Town

(1) To West African Ports.—In all cases, take Rhumb line tracks as direct as prudent navigation will allow. For ports east and south of Lagos, first make a position in lat. 4° 22′ N., long. 7° 44′ W., off Cape Palmas.

(2) To Cape Town.

(*a*) *Direct route.*—Proceed by Rhumb line tracks, as direct as prudent navigation will allow to a position in lat, 10° 40′ N., long. 17° 40′ W., and thence by Great Circle to Cape Town.

(*b*) *By St. Helena.*—Proceed as above to a position in lat. 10° 40′ N., long. 17° 40′ W., and thence by Rhumb line to St. Helena; thence continue by Great Circle to Cape Town.

(*c*) *By Ascension.*—Proceed as above to a position in lat. 10° 40′ N., long. 17° 40′ W., and thence by Rhumb line to Ascension; thence continue by Great Circle to Cape Town.

Note.—The Great Circle passes so close to St. Helena that the total distance is not materially increased by calling at that island as well.

Distances from Las Palmas are:—

By (1) *above:* To Accra, 2,212 miles; to Banana Creek (Congo R.), 3,108 miles; to Bathurst, 921 miles; to Conakry, 1,272 miles; to Dakar, 833 miles; to Douala, 2,803 miles; to Lagos, 2,432 miles; to Lobito, 3,388 miles; to Sierra Leone, 1,325 miles; to Takoradi, 2,113 miles.

By (2) *above.*

(a) Cape Town, 4,421 miles.
(b) St. Helena, 2,797 miles; Cape Town, 4,493 miles.
(c) Ascension, 2,189 miles; Cape Town, 4,585 miles.

Navigational Note.—See Route 48 (a).

Route 115.—*Reserved as spare.*

Route 116.—*Reserved as spare.*

(viii) ROUTES FROM ARQUIPÉLAGO DE CABO VERDE, DAKAR AND SIERRA LEONE

Route 117. Sao Vicente (Arquipélago do Cabo Verde) to Bishop rock and intermediate ports

(1) To Las Palmas (Islas Canarias).—Take Route 112 reversed. *Distance* 867 miles.

(2) To Madeira.—Take Route 105 reversed. *Distance*, 1,041 miles.

(3) To Gibraltar (via Las Palmas).—Take Routes 112 and 84, both reversed. *Distance* 1,565 miles.

(4) To Bishop rock.—Take Route 44 (2) reversed. *Distance* 2,171 miles.

Route 118. Sao Vicente to Arquipélago dos Açôres

Proceed by Rhumb line tracks as directly as navigation will allow.

Distance from São Vicente to Horta, 1,314 miles; to Ponta Delgada, 1,251 miles.

Route 119. Sao Vicente to New York or Halifax

In each case, and at all seasons, take the Great Circle track direct.

Distance from São Vicente, to New York (Ambrose L.V.), 2,912 miles; to Halifax, 2,564 miles.

Route 120. Sao Vicente to Providence channels and Gulf of Mexico

Follow a Great Circle track to a position in lat. 25° 50′ N., long. 77° 00′ W., in the entrance to Northeast Providence channel, and continue thence as in Route 88.

Distance from São Vicente to N.E. Providence channel, 2,940 miles.

See Section D. Part I. Index on pages 340 and 341.

Route 121. Sao Vicente to ports in the Caribbean sea

Follow a Great Circle track direct to a position in lat. 13° 28′ N., long. 61° 10′ W., 5 miles north of St. Vincent, West Indies, and continue thence as in Route 92.

Distance from São Vicente to Barbados, 2,020 miles; to Colon (Panama Canal), 3,245 miles; to St. Vincent (West Indies), 2,100 miles.

Route 122. Sao Vicente to Rio Amazonas

Follow a Great Circle track direct to a position 10 miles north of Ponta Tijoca, at the entrance to Rio Para.

Distance from São Vicente to Rio Para, 1,715 miles.

Route 123. Sao Vicente (Arquipélago de Cabo Verde) to South American ports

(1) To RECIFE.—Take the direct track from São Vicente, which crosses the meridian of 30° W. at lat 5° N., and passes at about 100 miles to the westward of St. Paul rocks; thence to about midway between Ilha de Fernando de Noronha and Atol das Rocas. *(See* CAUTION as to equatorial current under Route 113 (1).) Make the land at about 10 miles distance, bearing 270°, off Ponta de Olinda, and steer thence into Recife, as directly as navigation permits.

(2) To PÔRTO DO SALVADOR (BAIA).—Proceed as in (1), above, and having made the land off Recife, make towards Pôrto do Salvador, keeping at about 20 miles distance from the land. Steer to pass southward of Banco de S. Antonio, the channel to the northward being reported dangerous.

(3) To RIO DE JANEIRO, and PÔRTO DE SANTOS.—After leaving São Vicente, steer so as to pass 3 miles westward of Ilha de Fernando de Noronha; thence to pass 20 miles eastward of Arquipléago dos Abrolhos, and the same distnace off Cabo de S. Tome (*Lat. 22° 00′ S., Long. 40° 59′ W.*). The remainder of the voyage is the same as given in Route 113 (3).

(4) To RIO DE LA PLATA (*Lat. 35°10′ S., Long. 56°26′ W.*)—Take the above route (3), from São Vicente to the position off Cabo de S. Tome; and the remainder of the voyage is the same as given at Route 113 (4).

(5) To BAHIA BLANCA.—Take the above route (3), from São Vicente to the position off Cabo de S. Tome; and the remainder of the voyage is the same as given at Route 113 (5).

Distance from São Vicente (Arquipélago de Cabo Verde) to Bahia Blanca, 4,061 miles; Recife, 1,614 miles; Rio de Janeiro, 2,684 miles; Rio de La Plata (entrance), 3,676 miles; Santos, Pôrto de, 2,871 miles; Salvador (Baia), Pôrto do, 1,998 miles.

Note.—For the inshore navigation of all the above routes, the latest charts and South America Pilot, Part I, should be consulted.

See also General Remarks at the beginning of subsection (vi), Chapter III, on page 72.

Route 124. Sao Vicente to Cape Town

(a) Direct route.—Proceed by Rhumb line to the southward of São Tiago, Arquipélago de Cabo Verde, and thence take the Great Circle track to Cape Town.

(b) Via Ascension and St. Helena.—Take Rhumb line tracks until clear of Arquipélago de Cabo Verde, and thence proceed by Great Circle track to Ascension. From Ascension take a Rhumb line track to St. Helena, and thence continue by Great Circle track to Cape Town.

Distances from São Vicente to Cape Town by (*a*), 3,941 miles; by (*b*), 4,023 miles; to Ascension, 1,624 miles; St. Helena, 2,327 miles.

Navigational Note.—See Route 48 (a).

Route 125. Sao Vicente to ports on West Coast of Africa

(1) To DAKAR.—Proceed by Rhumb line tracks as directly as prudent navigation will allow, passing northwards of Ilha da Boa Vista.

CAUTION. The current generally sets strongly south-south-westward in the channel between Ilha da Boa Vista and Ilha do Sal; in addition abnormal magnetic variation has been reported off the eastern side of Ilha da Boa Vista and the western side of Ilha do Sal. *See* Africa Pilot, Part I.

(2) To SIERRA LEONE.—Proceed by Rhumb line tracks as directly as prudent navigation will allow, passing south of Ilha de São Tiago, the direct course thence clearing Bijagos South Breaker by about 20 miles.

(3) To PORTS EAST AND SOUTH OF SIERRA LEONE.—Follow Rhumb line tracks, south of Ilha de São Tiago to lat. 4° 20′ N., long. 9° 20′ W. (about 90 miles westward of Cape Palmas) and thence continue to destination as directly as prudent navigation will allow. *See* Africa Pilot, Parts I and II.

Distances from São Vicente are:—To Accra, 1,759 miles; to Banana Creek (Congo R.), 2,655 miles; to Dakar, 465 miles; to Douala, 2,350 miles; to Lagos, 1,979 miles; to Lobito, 2,935 miles; to Sierra Leone, 876 miles; to Takoradi, 1,659 miles.

Route 126. Dakar to Arquipélago de Cabo Verde, Islas Canarias, Gibraltar, or English channel (Bishop rock)

(1) To SÃO VICENTE (Arquipélago de Cabo Verde).—Take Route 125 (1) reversed. *Distance* 465 miles.

(2) To LAS PALMAS (Islas Canarias).—Take Route 114 (1) in reverse. *Distance* 833 miles.

(3) To GIBRALTAR.—Proceed by Rhumb line tracks as direct as navigation will allow. *See* Remarks in Route 46 regarding the approach to Gibraltar. *Distance* 1,498 miles.

(4) To BISHOP ROCK.—Take Route 47 reversed. *Distance* 2,196 miles.

Route 127. Dakar to Halifax and New York

(1) To HALIFAX.—Having cleared Cap Vert (Cape Verde), follow the Great Circle track to lat. 43° 20′ N., long. 60° 00′ W. (40 miles south of Sable island), and thence continue by Rhumb line to Halifax.

(2) To NEW YORK.—Follow the Great Circle track direct.

Distance from Dakar to Halifax, 2,955 miles; to New York (Ambrose L.V.), 3,334 miles.

Route 128. Dakar to Martinique, Guadeloupe, St. Vincent (West Indies) and Colon

(1) To MARTINIQUE and GUADELOUPE.—Having cleared Cap Vert (Cape Verde), proceed by Rhumb line tracks to a position about 20 miles south of São Vicente, passing between Ilha do Sal and Ilha da Boa Vista, and thence by Great Circle direct. For the approaches to Martinique and Guadeloupe *see* West Indies Pilot, Vol. II.

(2) To ST. VINCENT and COLON.—Having cleared Cap Vert, proceed as in (1) to a position midway between Ilha de Maio and Ilha da Boa Vista (*see* Africa Pilot, Part I. for the P.D. rocks in this channel), and thence continue by Great Circle to lat. 13° 28′ N., long. 61° 10′ W., 5 miles north of St. Vincent, West Indies; from thence to destination, *see* Route 92.

Distance from Dakar to Colon, 3,689 miles; to Guadeloupe (Pointe-a-Pitre), 2,553 miles; to Martinque (Fort de France), 2,551 miles; to St. Vincent, 2,544 miles.

Route 129. Dakar to Rio de Janeiro

Follow the Great Circle track direct to lat. 22° 15′ S., long. 40° 40′ W., about 20 miles off Cabo de S. Tome (St. Thome); thence proceed as directly as prudent navigation will allow, rounding Cabo Frio at a distance of about 3 miles. *(See* South America Pilot, Part I).

Distance from Dakar to Rio de Janeiro, 2,761 miles.

Route 130. Sierra Leone to Arquipélago de Cabo Verde, Islas Canarias, Madeira, Gibraltar, or English channel (Bishop rock)

(1) To São Vicente (Arquipélago de Cabo Verde). —Take Route 125 (2) reversed. *Distance* 876 miles.

(2) To Las Palmas (Islas Canarias).—Take Route 114 (1) reversed. *Distance* 1,325 miles.

(3) To Madeira.—Take Route 106 (2) reversed. *Distance* 1,580 miles.

(4) To Gibraltar.—Proceed by Rhumb line tracks as direct as navigation will allow. *See* Remarks in Route 46 regarding the approach to Gibraltar. *Distance* 1,990 miles.

(5) To Bishop rock.—Take Route 47 reversed. *Distance* 2,687 miles.

Route 131. Sierra Leone to New York

Follow Rhumb line track to a position about 10 miles south-west of Ilha de São Tiago (*see* Route 125 (2)); thence follow a Great Circle track to New York.

Distance from Sierra Leone to Ambrose L.V., 3,763 miles.

Route 132. Sierra Leone to Barbados, St. Vincent, and Colon

(1) To Barbados.—Take the Great Circle track direct.

(2) To St. Vincent and Colon.—Follow the Great Circle to lat. 13° 28′ N., long. 61° 10′ W., 5 miles north of St. Vincent, West Indies, and thence continue to destination as directly as navigation will allow.

Distance from Sierra Leone to Barbados, 2,746 miles; to Colon, 3,982 miles; to St. Vincent, 2,837 miles.

Route 133. Sierra Leone to Estrecho de Magallanes (Magellan).—*See* South America Pilot, Part II.

After clearing Shoals of St. Ann, follow the Great Circle track direct to Dungeness (*Lat. 52° 25′ S., Long. 68° 27′ W.*).

See caution regarding Ice at the beginning of Sub-section (vii) of Chapter III, Part I. on page 75.

Distance from Sierra Leone to Dungeness, 4,618 miles.

Route 134.—*Reserved as spare.*

(ix) FROM PORTS ON THE WEST COAST OF AFRICA

Route 135. From West African ports (east and south of Sierra Leone) to Islas Canarias and English channel (Bishop rock)

(1) To Las Palmas (Islas Canarias).—Take the reverse of Route 114 (1).

Distances as in that route.

(2) To Bishop rock.—Take the reverse of Route 47. *Distances* as in that route.

Route 136. West African ports (east and south of Sierra Leone) to Halifax and New York

In each case follow the reverse of Route 125 (3) to São Vicente (Arquipélago de C. Verde) and thence continue by Great Circle track to destination; *see* Route 119.

Distances to Halifax and New York:—

From Accra to Halifax, 4,290 miles; to New York (Ambrose L.V.), 4,649 miles.

From Banana Creek (Congo R.), to Halifax, 5,185 miles; to New York (Ambrose L.V.), 5,544 miles.

From Douala, to Halifax, 4,881 miles; to New York (Ambrose L.V.), 5,240 miles.

From Lagos to Halifax, 4,510 miles; to New York (Ambrose L.V.), 4,869 miles.

From Lobito to Halifax, 5,465 miles; to New York (Ambrose L.V.), 5,824 miles.

From Takoradi to Halifax, 4,190 miles; to New York (Ambrose L.V.), 4,549 miles.

Route 137. West African ports, east and south of Sierra Leone, to Colon

(1) From ports between Takoradi and Douala.—In each case, proceed as directly as prudent navigation will allow to lat. 4° 20′ N., long. 9° 10′ W., off Cape Palmas, thence continue by Great Circle track to lat. 11° 35′ N., long. 60° 35′ W., about 10 miles north of Tobago, and then steer as directly as prudent navigation will allow to Colon. *See* West Indies Pilot, Vols. II. and I.

(2) From Congo river and Lobito.—In each case, follow the Great Circle track direct to lat. 11° 00′ N., long. 61° 00′ W., about 10 miles north of Trinidad, and thence continue as directly as prudent navigation will allow to Colon. *See* West Indies Pilot, Vols. II. and I.

Note.—The track from Lobito passes only about 20 miles north of St. Paul rocks, which lie within the northern part of the South Equatorial Current; *see* South America Pilot, Part I.

Distances to Colon are:—

From Accra, 4,813 miles. From Banana Creek (Congo River), 5,667 miles. From Douala, 5,404 miles. From Lagos, 5,033 miles. From Lobito, 5,816 miles. From Takoradi, 4,713 miles.

Route 138.—*Reserved as spare.*

(x) ROUTES FROM ASCENSION AND ST. HELENA

See Africa Pilot, Part II.

Route 139. Ascension to Arquipélago de Cabo Verde, Islas Canarias, Gibraltar and English channel (Bishop rock)

(1) To São Vicente (Arquipélago de Cabo Verde). —Take the Great Circle track. *See* Route 124 (b). *Distance* 1,624 miles.

(2) To Las Palmas (Islas Canarias).—Take the reverse of Route 114 (2) (c). *Distance* 2,189 miles.

(3) To Gibraltar.—Proceed by Rhumb line tracks either via Las Palmas (*See* Routes 114 (2) (c) and 84) or, leaving Islas Canarias to the westward, keep along the African coast to Gibraltar. The latter is shorter by some 30 miles. *Distance* via Las Palmas is 2,889 miles.

(4) To Bishop rock.—Proceed via Islas Canarias on the reverse of Routes 114 (2) (c) and 44 (4). *Distance* 3,554 miles.

Route 140. Ascension to New York

At all seasons, follow the Great Circle track direct.

Distance from Ascension to Ambrose light vessel, 4,396 miles.

Route 141. Ascension to Colon (Panama Canal)

Follow the Great Circle track direct to lat. 11° 00′ N., long. 61° 00′ W., about 10 miles north of Trinidad, and thence continue as directly as prudent navigation will allow, to Colon.

Distance from Ascension to Colon, 4,170 miles.

See Section D. Part I. Index on pages 340 and 341.

Route 142. Ascension to Rio de Janeiro

Follow the Great Circle track direct to lat. 23° 11′ S., long. 42° 00′ W., about 10 miles south of Cabo Frio, and thence continue as directly as prudent navigation will allow, to Rio de Janeiro.

Note.—The Great Circle course passes somewhat closely to the 4½ fathoms ($8^{\text{m}}2$) charted about 54 miles east-north-east of Cabo de S. Tome.

Distance from Ascension to Rio de Janeiro, 1,899 miles.

Route 143. Ascension to Rio de La Plata

Follow a Rhumb line track to lat. 34° 50′ S., long. 54° 04′ W., about 10 miles south-east of Cabo Santa Maria, and thence procced to destination as directly as prudent navigation will allow. The directions given in South America Pilot, Part I. should be followed.

Distance from Ascension to Rio de La Plata (entrance), lat. 35° 10′ S., long. 56° 26′ W., 2,830 miles.

Route 144. Ascension to Stanley, Falkland Islands

Follow the Rhumb line tracks direct, passing through a position in lat. 36° 00′ S., long. 40° 00′ W.

Distance from Ascension to Stanley, 3403 miles.

CAUTION. Ice may be encountered in the vicinity of the Falkland islands. For details *see* Caution at the beginning of Sub-section (vii), Chapter III., Part I. on page 75.

Route 145. Ascension to West African ports

In each case take the Great Circle track direct.

Distances from Ascension are:—

To Accra, 1,174 miles; to Banana Creek (Congo R.) 1,605 miles; to Douala, 1,619 miles; to Lagos, 1,371 miles; to Lobito, 1,675 miles; to Takoradi, 1,086 miles.

Route 146. Ascension to St. Helena and Cape Town

Follow Route 48 (b) (ii) or (iii). *See* Navigational Note at the end of Route 48 (a).

Distance from Ascension to St. Helena, 703 miles; to Cape Town, 2,396 miles.

Route 147. St. Helena to Arquipélago de Cabo Verde, Islas Canarias, Gibraltar, or English channel (Bishop rock)

(1) To SÃO VICENTE (Arquipélago de Cabo Verde).—Take the reverse of Route 124 (b). *Distance*, 2,327 miles.

(2) To LAS PALMAS (Islas Canarias).—Take the reverse of Route 114 (2) (b). *Distance* 2,797 miles.

(3) To GIBRALTAR.—Proceed as in (2) above to Las Palmas and thence by Rhumb line or, leaving Islas Canarias to the westward, keep along the African coast to Gibraltar. The latter is about 30 miles shorter. *Distance* via Las Palmas, 3,497 miles.

(4) To BISHOP ROCK.—Proceed via Islas Canarias on the reverse of Routes 114 (2) (b) and 44 (4). *Distance* 4,162 miles.

Route 148. St. Helena to Ascension and New York

At all seasons, take the Great Circle track direct to New York. As this track passes very close to Ascension, the total distance to New York will be increased by only six miles if a call is made at the former.

Distances from St. Helena to Ascension, 703 miles; to New York (direct), 5,093 miles.

Route 149. St. Helena to Colon (Panama Canal)

Follow the Great Circle track to a position in lat. 11° 00′ N., long. 61° 00′ W., about 10 miles north of Trinidad, and thence proceed as direct as navigation will allow to Colon.

Distance from St. Helena to Colon, 4,822 miles.

Route 150. St. Helena to Rio de Janeiro

Follow the Great Circle track direct to lat. 23° 11′ S., long. 42° 00′ W., about 10 miles south of Cabo Frio, and thence proceed as directly as prudent navigation will allow, to Rio de Janeiro.

Distance from St. Helena to Rio de Janeiro, 2,159 miles.

Route 151. St. Helena to Rio de La Plata

Follow the Great Circle track direct to lat. 34° 50′ S., long. 54° 04′ W., about 10 miles south-east of Cabo Santa Maria, and thence proceed to destination as directly as prudent navigation will allow, following the directions given in South America Pilot, Part I.

Distance from St. Helena to Rio de La Plata (*entrance Lat. 35° 10′ S., Long. 56° 26′ W.*), 2,942 miles.

Route 152. St. Helena to Estrecho de Magallanes (Magellan Strait)

Take a Rhumb line track direct to Dungeness (*Lat. 52° 25′ S., Long. 68° 27′ W.*). *See* South America Pilot, Part II., and Caution regarding Ice at the beginning of Sub-section (vii), Chapter III, Part I.

Distance from St. Helena to Dungeness, 3,743 miles.

Route 153. St. Helena to West African ports

(1) To DAKAR.—Proceed by Rhumb line tracks direct to a position in lat. 10° 40′ N. long. 17° 05′ W., about 45 miles west of Bijagos South Breaker, and thence continue as direct as navigation will allow to Dakar.

(2) To SIERRA LEONE.—Follow Rhumb line tracks as direct as navigation will allow to clear the Shoals of St. Ann, and thence continue to Sierra Leone.

(3) To PORTS BETWEEN TAKORADI and LOBITO.—In each case proceed as direct as prudent navigation will allow.

Distances from St. Helena are:—To Accra, 1,328 miles; to Banana Creek (Congo R.), 1,223 miles; to Dakar, 1,977 miles; to Douala, 1,510 miles; to Lagos, 1,445 miles; to Lobito, 1,144 miles; to Sierra Leone, 1,556 miles; to Takoradi, 1,274 miles.

Route 154. St. Helena to Cape Town.

Follow the Great Circle track direct. *See* Africa Pilot, Part II. and Navigational Note at the end of Route 48 (a).

Distance from St. Helena to Cape Town, 1,696 miles.

Route 155.—*Reserved as spare.*

(xi) ROUTES FROM CAPE TOWN

See Africa Pilot, Part II.

Route 156. Cape Town to English channel (Bishop rock) and certain intermediate ports

Take the reverse of Route 48 (a), (b), (b) (i), (b) (ii) or (b) (iii). *Distances* are as given in that route.

For route to Islas Canarias, Madeira, St. Helena, or Ascension, take the reverse of the appropriate portion of Route 48 (a), 48 (b), 48 (b) (i), and 48 (b) (ii), respectively.

Distance from Cape Town to Las Palmas (Islas Canarias), 4,421 miles; to Madeira, 4,677 miles; to St. Helena, 1,696 miles; to Ascension, 2,396 miles.

Route 157. Cape Town to Arquipélago de Cabo Verde

Take the reverse of Route 124 either (a) or (b).

Distance from Cape Town is as given in that Route viz., (a), 3,941 miles; (b), 4,023 miles.

Route 158. Cape Town to Gibraltar

Follow a Great Circle track to a position in lat. 10° 40′ N., long. 17° 40′ W., and thence proceed by Rhumb line tracks either via Islas Canarias, or along the African coast, to Gibraltar. The latter is some 34 miles the shorter.

Distance from Cape Town to Gibraltar, via Las Palmas, 5,121 miles.

Route 159. Cape Town to Gulf of St. Lawrence

See St. Lawrence Pilot and Cautions regarding Newfoundland coasts and Cabot strait at the beginning of this chapter.

(a) Direct route.—Follow the Great Circle track direct to a position in lat. 47° 22′ N., long. 59° 40′ W. (in the entrance to Cabot strait), passing about 60 miles south-west of Bijagos South Breaker, and about 30 miles north-east of Ilha do Sal, Arquipélago de Cabo Verde; from thence proceed, as direct as prudent navigation will allow, through Cabot strait, to destination.

(b) Via Arquipélago de Cabo Verde.—A call at São Vicente increases the total distance from Cape Town to the Gulf of St. Lawrence by only 21 miles. First proceed on the reverse of Route 124 (a) to São Vicente; thence follow the Great Circle track to a position in lat. 47° 22′ N., long. 59° 40′ W.; thence continue in (a) above.

Distance from Cape Town to Montreal by (a) is 7,115 miles.

Route 160. Cape Town to Halifax

Follow the Great Circle track to São Vicente (Arquipélago de Cabo Verde), *see* Route 124, and thence take a second Great Circle to Halifax. *See* Route 119.

Distance from Cape Town to Halifax, 6,505 miles.

Route 161. Cape Town to New York

(a) Direct route.—Follow the Great Circle track direct.

Note.—This track passes about 20 miles north-east of St. Helena, and about 50 miles north-east of Ascension, before crossing the equator in about long. 21° W., and there is no material increase in distance if calls are made at either or both these islands.

(b) By São Vicente (Arquipélago de Cabo Verde).—Take the reverse of Route 124 (a), as far as São Vicente and thence follow the Great Circle track direct. *See* Route 119.

Distance from Cape Town to New York by (a) Direct, 6,787 miles; by (b), Via São Vicente, 6,853 miles.

Route 162. Cape Town to Colon (Panama Canal), to Curaçao, and to Trinidad

Follow the Great Circle track to lat. 4° 40′ S., long. 34° 35′ W., about midway between Cabo de San Roque and Atol das Rocas, and thence proceed by Rhumb line to lat. 11° 00′ N., long. 61° 00′ W., and thence, as directly as prudent navigation will allow, to destination.

Distance from Cape Town to Colon, 6,437 miles; to Curaçoa, 5,747 miles; to Trinidad, 5,327 miles.

Route 163. Cape Town to Barbados and to ports in Caribbean sea and Gulf of Mexico

Follow the Great Circle track to lat. 4° 40′ S., long. 34° 35′ W., about midway between Cabo San Roque and Atol das Rocas, and thence proceed by Rhumb line tracks to Barbados or, if bound for the Caribbean sea, to lat. 13° 28′ N., long. 61° 10′ W., 5 miles north of St. Vincent, W. Indies: Thence continue as given in Route 92 to destination.

Distance from Cape Town to Barbados, 5,268 miles; to St. Vincent (5 miles N. of), 5,349 miles. The distances from St. Vincent to ports in the Caribbean are given in Route 92.

Route 164. Cape Town to Recife or Pôrto do Salvador (Baia)

In each case follow the Great Circle track direct.

Distance from Cape Town to Recife, 3,318 miles; to Porto do Salvador (Baia), 3,336 miles.

Route 165. Cape Town to Rio de Janeiro

(a) Usual route.—Follow the direct Rhumb line track.

Distance from Cape Town to Rio de Janeiro, 3,310 miles.

(b) Low Powered Steamers.—These vessels should take a track about 350 miles to the northward of the Rhumb line, crossing

long.	10° East	in lat.	29° 50′ S.
,,	0°	,, ,,	25° 20′ S.
,,	10° West	,,	22° 50′ S.
,,	20° ,,	,,	21° 10′ S.
,,	30° ,,	,,	21° 10′ S.

passing southward of, and sighting Ilha da Trindade island and Ilhas Martin Vaz.

The distance is 3,510 miles, but better weather and more favourable currents will be experienced.

Route 166. Cape Town to Rio de La Plata

(a) Usual route.—Follow the direct Rhumb line track (which lies almost on the parallel of 35° 00′ S.).

Distance from Cape Town to Rio de La Plata, 3,704 miles.

(b)Low Powered Steamers.—These vessels take the Rhumb line track for Rio de Janeiro (Route 165 (a)) as far as long. 20° W., and then a second Rhumb line to destination.

The *distance* is 3,953 miles, but lighter winds, and more favourable currents will be experienced than by (a), above.

Route 167. Cape Town to Estrecho de Magallanes (Magellan strait), or to Falkland islands

(a) Usual route.—Follow the Rhumb line track as for Rio de La Plata (Route 166 (a)) as far as long. 40°W. and thence a second Rhumb line to destination.

(b) Low Powered Steamers.—These vessels take the Rhumb line track as for Rio de Janeiro (Route 165 (a)) as far as long. 20° W., and thence a second Rhumb line to destination.

The extra distances (175 miles to Dungeness, and 126 miles to Stanley) would probably be more than made up by the lighter winds and more favourable currents experienced on this route, and saving in wear and tear.

Note.—Should fuel be running short, the first course could be continued to Rio de Janeiro (3,310 miles) or to Montevideo (3,953 miles) (Route 116 (b)); and a second start made for destination, thence.

Distances from Cape Town by the above Routes are:—

To Estrecho de Magallanes (Dungeness): By (a), 4,494 miles; by (b), 4,669 miles; via Rio de Janeiro, 5,458 miles; via Montevideo, 4,914 miles.

To Stanley, Falkland I.: By (a), 4,157 miles; by (b), 4,283 miles; via Rio de Janeiro, 5,170 miles; Montevideo, 4,740 miles.

CAUTION.—*See* Caution on Ice at the beginning of Sub-section (vii), Chapter III, Part I.

Route 168.—*Reserved as spare.*

Route 169.—*Reserved as spare.*

The Routes from Cape Town to the eastward are given under Indian ocean Routes. See Section B., Part III, Chapter III.

SECTION B. PART I

Chapter III

ROUTES FROM PORTS ON WESTERN SIDE OF ATLANTIC OCEAN

(I) FROM HUDSON BAY AND GREENLAND

Route 170. Churchill harbour to European ports

In all cases follow the reverse of the route described in Chapter II as summarised below.

Note.—The distance from Churchill harbour to the entrance to Hudson strait, in lat. 61° 00′ N., long. 64° 55′ W., is 943 miles.

(1) To BERGEN.—Route 10. *Distance,* 3,113 miles. Page 43.

(2) To CAPE WRATH.—Route 19. *Distance,* 2,810 miles. Page 43.

(3) To FASTNET.—Route 30. *Distance,* 2,852 miles. Page 45.

(4) To GIBRALTAR.—Route 76 (1). *Distance,* 3,657 miles. Page 52.

(5) To INISHTRAHULL.—Route 25. *Distance,* 2,807 miles. Page 44.

(6) To LISBON.—Route 66. *Distance,* 3,387 miles. Page 51.

(7) To LINDESNES (THE NAZE).—Route 14. *Distance,* 3,181 miles. Page 43.

(8) To NORDKAPP.—Route 2 (2). *Distance,* 3,440 miles. Page 42.

(9) To PAUILLAC (BORDEAUX).—Route 52. *Distance,* 3,362 miles. Page 49.

(10) To REYKJAVIK.—Route 15. *Distance,* 2,525 miles. Page 43.

(11) To TRONDHEIM.—Route 6. *Distance,* 3,200 miles. Page 42.

(12) To VIGO.—Route 58. *Distance,* 3,246 miles. Page 50.

Route 171. Churchill harbour to Arquipélago dos Açôres

Proceed as directly as prudent navigation will allow across Hudson bay and through Hudson strait, and thence follow the Great Circle track to destination.

Distance from Churchill harbour to Horta, 2,852 miles; to Ponta Delgada, 2,970 miles.

Route 172. Disko bugt (Godhavn) or Ivigtut to European ports

In all cases follow the reverse of the route described in Chapter II, as summarised below.

Note.—The distance from Disko bugt to a position 75 miles south of Cape Farewell is 769 miles.

(1) To BERGEN.—Route 10. *Distance,* 2,272 miles.

(2) To CAPE WRATH.—Route 19. *Distance,* 1,969 miles.

(3) To FASTNET.—Route 30. *Distance,* 2,011 miles.

(4) To GIBRALTAR.—Route 76 (2). *Distance,* 2,833 miles.

(5) To INISHTRAHULL.—Route 25. *Distance,* 1,966 miles.

(6) To LINDESNES (THE NAZE).—Route 14. *Distance,* 2,340 miles.

(7) To NORDKAPP.—Route 2 (2). *Distance,* 2,599 miles.

(8) To PAUILLAC (BORDEAUX).—Route 52. *Distance,* 2,523 miles.

(9) To REYKJAVIK.—Route 15. *Distance,* 1,684 miles.

(10) To TRONDHEIM.—Route 6. *Distance,* 2,359 miles.

(11) To VIGO.—Route 58. *Distance,* 2,405 miles.

Note.—The distances given above are from Disko bugt. From Ivigtut they are 529 miles less.

Route 173. Ivigtut to New York

Steer by Rhumb line tracks, as directly as prudent navigation will allow to, and through the Strait of Belle Isle, and through Cabot strait (or Gut of Canso); thence proceed to New York, passing south of Nantucket Shoals.

Note.—Ships with local knowledge can use Nantucket Sound, and reduce the total distance by 19 miles.

Distance from Ivigtut to New York, 1,800 miles.

(ii) FROM CANADIAN PORTS AND NEWFOUNDLAND

(*See* General Remarks at the beginning of Chapter II. concerning passages between Canada or United States and the British Isles).

Route 174. Belle Isle to North European ports

In all cases follow the reverse of the route described in Chapter II. as summarised below.

(1) To BERGEN.—Route 11. *Distance,* 2,028 miles.

(2) To NORDKAPP.—Route 3. *Distance,* 2,394 miles.

(3) To TRONDHEIM.—Route 7. *Distance,* 2,135 miles.

Route 175. Belle Isle to Reykjavik

From a position 7 miles south of Belle Isle, follow the Great Circle track direct, passing about 100 miles south of Cape Farewell.

Distance from Belle Isle to Reykjavik, 1,278 miles.

Route 176. Gulf of St. Lawrence to Cape Wrath

(a) April 11th to May 15th or until the Cape Race route is clear of ice.—Follow Rhumb line tracks from the Gulf of St. Lawrence, through Cabot strait to lat. 45° 25′ N., long. 50° 00′ W., and steer thence by Great Circle to Cape Wrath.

(b) May 16th to opening of Strait of Belle Isle, and to November 30th when not using the Strait of Belle Isle.—Follow Rhumb line tracks from the Gulf of St. Lawrence, through Cabot strait to a position 25 miles south of Cape Race, and thence follow a course about 10 miles to the southward of the direct Great Circle track to Cape Wrath, until approaching that Cape.

(c) From opening of Strait of Belle Isle to November 14th.—Proceed by Rhumb line tracks from the River St. Lawrence, through the Strait of Belle Isle, and thence follow courses keeping about 20 miles to the southward of the Great Circle between Belle Isle and Cape Wrath, until approaching that cape.

Distance from Montreal to Cape Wrath by (a), 2,900 miles; by (b), 2,822 miles; by (c), 2,595 miles.

Route 177. Gulf of St. Lawrence to Inishtrahull

See Newfoundland and Labrador, and Irish Coast Pilots.

(a) April 11th to *May 15th, or until the Cape Race route is clear of ice.*—From the Gulf of St. Lawrence,

See Section D. Part I. Index on pages 340 and 341.

pass through Cabot strait on a Rhumb line track to lat. 45° 25′ N., long. 50° 00′ W., and thence steer on a Great Circle track to Inishtrahull.

See Admiralty Chart 2058c, Track E (eastbound).

(b) May 16th to opening of Strait of Belle Isle, and to November 30th, when not using Strait of Belle Isle.—Pass through Cabot strait, and steer as directly as navigation permits to a point 25 miles southward of Cape Race. Take a course 10 miles southward of the Great Circle track from off Cape Race to Inishtrahull, until approaching Inishtrahull.

See Admiralty Chart 2058c, Track F (eastbound).

(c) From opening of Strait of Belle Isle to November 14th.—Pass from the River St. Lawrence through the Strait of Belle Isle, keeping in the fairway; and take a course 10 miles southward of the Great Circle track from Belle Isle until approaching Inishtrahull.

See Admiralty Chart 2058c, Track G (eastbound).

Distance from Montreal to Inishtrahull by (a), 2,811 miles; by (b), 2,746 miles; by (c), 2,565 miles.

Route 178. Gulf of St. Lawrence to Fastnet, and to Bishop rock

(a) April 11th to May 15th, or until the Cape Race route is clear of ice.—Follow Rhumb line tracks from the Gulf of St. Lawrence through Cabot strait to lat. 45° 25′ N., long. 50° 00′ W., and thence proceed by Great Circle track either to Fastnet or to Bishop rock. *See* Chart 2058b, Track E (eastbound).

(b) May 16th to opening of Strait of Belle Isle, and to November 30th, when not using the Strait of Belle Isle.—Follow Rhumb line tracks through the Gulf of St. Lawrence and Cabot strait to a position 25 miles south of Cape Race, thence follow a track 10 miles to the southward of the Great Circle between the position 25 miles south of Cape Race and either Fastnet or Bishop rock until approaching desired destination.

See Chart 2058b, Track F (eastbound).

(c) From opening of Strait of Belle Isle to November 14th.—Follow Rhumb line tracks from the River St. Lawrence through the Strait of Belle Isle, and thence steer along a track 10 miles to the southward of the Great Circle between Belle Isle and either Fastnet or Bishop rock until approaching desired destination.

See Chart 2058b, Track G (eastbound).

Distances from Montreal are:—To Fastnet by (a), 2,727 miles; by (b), 2,686 miles; by (c), 2,560 miles. To Bishop rock by (a), 2,857 miles; by (b), 2,814 miles; by (c), 2,705 miles.

Notes.—Directions for the termination of these routes to the Irish sea, the Bristol channel and the English channel will be found in the Irish Coast, the West Coast of England, and the Channel (Part I) Pilots, but special attention is drawn to:—

Fisheries.—Trawling is carried out within the 300 fathom (548^{m}6) line off the south-west and south coasts of Ireland down to lat. 49° 00′ N. all the year round, though chiefly in the autumn.

Drift net fishing is carried out a long way off the south-west of Ireland from April to June, and closer inshore, off the south-west and south coasts from May to November. *See* also the remarks on Fisheries at the beginning of sub-section (ii) D. of Chapter II. on page 45.

CAUTION.—*Currents.*—It is necessary, in shaping a course from or to the entrance to the Channel to take into consideration the present, and lately prevailing winds and weather, in order to make allowance for the set of the swell, and influence of current.

This requires great judgment, for the currents of these seas are merely the prolonged movement of the water resulting from recent gales; and their actual direction may differ from the direction indicated by the set of the swell.

After south-westerly, or westerly gales, a current setting towards the mouth of the Channel may be expected; the rate dependent on the strength and continuance of the preceding gale and on the distance at which it passed.

When, however, strong or long continued westerly winds have prevailed westward of the northern coast of Spain, an outset from the northern part of the Bay of Biscay may be expected, flowing obliquely across the fairway of the entrance to the Channel, setting a vessel to the north-westward. This current is not frequent in occurrence, but it may attain a rate of 1½ knots, and the knowledge of its existence should induce great caution. It has been known to be felt past Land's End as far as the Bristol channel.

The months of the year during which it may be expected are from October to February, inclusive.

For information as to Tidal Streams, *see* Channel Pilot, Part I.

Route 179.—Gulf of St. Lawrence to Arquipélago dos Açôres

Follow Rhumb line tracks from the Gulf of St. Lawrence, through Cabot strait to a position 25 miles south of Cape Race; thence proceed by Great Circle track to destination.

Distance from Montreal to Horta, 2,141 miles; to Ponta Delgada (São Miguel), 2,281 miles.

Route 180. Gulf of St. Lawrence to Pauillac (Bordeaux)

Follow the tracks given in Route 178, according to season to the positions (a), 45° 25′ N., 50° 00′ W.; (b), 25 miles south of Cape Race; (c), 7 miles south of Belle Isle. Thence, in each case, proceed on the Great Circle track to the mouth of Estuaire de la Gironde, and thence to destination. *See Bay of Biscay Pilot.*

CAUTION. The track from (c), above, passes only about 10 miles south of Plateau de Rochebonne (*Lat. 46° 12′ N., Long. 2° 26′ W.*).

Distance from Montreal to Pauillac (Bordeaux) by (a), 3,150 miles; by (b), 3,126 miles; by (c), 3,032 miles.

Route 181. Gulf of St. Lawrence to Gibraltar, Vigo, or Lisbon.

See General remarks and cautions at the beginning of Chapter II on page 41.

(1) To GIBRALTAR.—Proceed by Rhumb line tracks through the Gulf of St. Lawrence and Cabot strait to lat. 45° 25′ N., long. 50° 00′ W., and thence by Great Circle to lat. 36° 55′ N., long. 9° 05′ W., about 10 miles south-west of Cape St. Vincent; from thence steer as directly as prudent navigation will allow to Gibraltar, keeping in mid-channel to take full advantage of the prevailing easterly current entering the Mediterranean.

(2) To VIGO.—Proceed as above, but leave the transatlantic Great Circle at 30° W. longitude, and from thence take a second Great Circle track to Vigo.

(3) To LISBON.—Proceed as in (1) above, but leave the transatlantic Great Circle at 15° W. longitude, and from thence steer directly to Lisbon.

Distance from Montreal to Gibraltar, 3,191 miles; to Vigo, 2,901 miles; to Lisbon, 2,961 miles.

Route 182. Gulf of St. Lawrence to Arquipélago de Cabo Verde and to Cape Town

Follow Route 159 (a) or (b) reversed.

Distance from Montreal to São Vicente, 3,195 miles; to Cape Town, 7,115 miles.

Route 183. St. John's, Newfoundland to Inishtrahull, Fastnet or Bishop rock

In each case follow the reverse of the route described in Chapter II as summarised below.

(1) To INISHTRAHULL.—Route 26 (2). *Distance,* 1,728 miles.

(2) To Fastnet.—Route 32. *Distance*, 1,672 miles.

(3) To Bishop rock.—Route 37. *Distance*, 1,806 miles.

Route 184. St. John's, Newfoundland, to Arquipélago dos Açôres

Follow the Great Circle track direct.

Distance from St. John's to Horta, 1,185 miles; to Ponta Delgada, 1,326 miles.

Route 185. St. John's, Newfoundland to Arquipélago de Cabo Verde

Follow the Great Circle track direct, passing south of Virgin rocks.

Distance from St. John's to São Vicente, 2,301 miles.

Route 186. Halifax to Reykjavik

Proceed on Rhumb line tracks to a position 25 miles south of Cape Race, and thence on a Great Circle track direct to destination.

Distance from Halifax to Reykjavik, 1,947 miles.

Route 187. Halifax to Nordkapp

Following Route 189 (a), (b) or (c), according to season, to a position in lat. 57° 50′ N., long. 18° 00′ W., and thence take the Great Circle track direct to Nordkapp.

Distance from Halifax to Nordkapp by (a), 3,502 miles; by (b), 3,297 miles; by (c), 3,239 miles.

Route 188. Halifax to Trondheim and Bergen

(1) To Trondheim: *See* Note below (2) (c).

(*a*).—Follow Rhumb line tracks to a position 60 miles south of Sable island and thence to lat. 42° 00′ N.; long. 50° 00′ W; thence take the Great Circle track to a position 10 miles south of Færöes, and thence continue by Rhumb line tracks to Trondheim.

(*b*).—Steer on a Rhumb line direct to lat. 45° 25′ N., long. 50° 00′ W., and thence by Great Circle to a position 10 miles north of Færöes; and thence proceed by Rhumb line tracks to Trondheim.

(*c*).—Follow Rhumb line tracks direct to a position 25 miles of Cape Race, and thence a Great Circle track direct to lat. 63° 18′ N., long. 7° 40′ E., in the Grip-Holen approach to Trondheim. *See Norway Pilot, Part II.*

(2) To Bergen. *See* Note below (2) (c).

(*a*).—Proceed as for (1) (a) above to lat. 42° 00′ N., long. 50° 00′ W., and thence take a Great Circle track to Sumburgh head, Shetland. From Sumburgh head steer on Rhumb line tracks to Bergen.

(*b*).—As for (1) (b), above, to lat. 45° 25′ N., long. 50° 00′ W.; thence steer on a Great Circle track to Sumburgh head, and thence continue on Rhumb line tracks to Bergen.

(*c*).—As for (1) (c), above, to the position 25 miles south of Cape Race; thence steer on a Great Circle to Sumburgh head, and thence continue on Rhumb line tracks to Bergen.

See General remarks at the beginning of Chapter II. The choice of the routes given above should be decided by the North Atlantic lane route in force.

Distances from Halifax are:—

To Trondheim, by (a), 3,070 miles; by (b), 2,861 miles; by (c), 2,781 miles.

To Bergen, by (a), 2,904 miles; by (b), 2,709 miles; by (c), 2,645 miles.

Route 189. Halifax to Cape Wrath

(a) February 15*th to April* 10*th (both days inclusive).*—Steer on Rhumb line tracks, first to a point 60 miles south of Sable island, and thence to lat 42° 00′ N., long. 50° 00′ W. From this point, take the Great Circle track to lat. 57° 50′ N., long. 18° 00′ W.; and thence on a second Great Circle track to Cape Wrath.

(b) April 11*th to May* 15*th and December* 1*st to February* 14*th (both inclusive).*—Steer on a direct Rhumb line track to lat. 45° 25′ N., long. 50° 00′ W. Take the Great Circle track thence to lat. 57° 50′ N., long. 18° 00′ W.; and thence on a second Great Circle track to Cape Wrath.

(c) May 16*th to November* 30*th (both days inclusive).*—Steer on a direct Rhumb line to a point 10 miles south of Cape Race, and thence on a Great Circle direct to Cape Wrath. *See* General remarks and Cautions at the beginning of Chapter II.

Distance from Halifax to Cape Wrath by (a), 2,580 miles; by (b), 2,384 miles; by (c), 2,324 miles.

Route 190. Halifax to Inishtrahull

(a) February 15*th to April* 10*th (both days inclusive).*—Steer on Rhumb line tracks, first to a point 60 miles south of Sable island, and thence to lat. 42° 00′ N., long. 50° 00′ W. Take the Great Circle track thence to destination. *See* Admiralty Chart 2058c. Track D (eastbound).

(b) April 11*th to May* 15*th (both days inclusive), or until the Cape Race route is clear of ice, and from December* 1*st to February* 14*th.*—Steer on a direct Rhumb line track to lat. 45° 25′ N., long. 50° 00′ W.; and thence on a Great Circle track thence to destination. *See* Admiralty Chart 2058c., Track E (eastbound).

(c) May 16*th to November* 30*th (both days inclusive).*—Steer on a Rhumb line to a position 25 miles southward of Cape Race, thence on a course 10 miles southward of the Great Circle track until approaching Inishtrahull. *See* Admiralty Chart 2058c, Track F (eastbound).

Distance from Halifax to Inishtrahull by (a), 2,469 miles; by (b), 2,295 miles; by (c), 2,249 miles.

Route 191. Halifax to Fastnet and to Bishop rock

(a) February 15*th to April* 10*th (inclusive).*—Follow Rhumb line tracks first to a position 60 miles south of Sable island, and thence to lat. 42° 00′ N., long. 50° 00′ W., and thence Great Circle tracks, either to Fastnet, or to Bishop rock. *See* Chart 2058b, Track D (eastbound).

(b) April 11*th to May* 15*th, or until the Cape Race route is clear of ice, and from December* 1*st to February* 14*th (all dates inclusive).*—Proceed by Rhumb line direct to lat. 45° 25′ N., long. 50° 00′ W., and thence by Great Circle tracks, either to Fastnet, or to Bishop rock. *See* Chart 2058b, Track E (eastbound).

(c) May 16*th to November* 30*th (inclusive).*—Proceed by Rhumb line direct to a position 25 miles south of Cape Race, and thence on tracks 10 miles to the southward of the Great Circles to Fastnet or Bishop rock, and thence to destination as directly as prudent navigation will allow. *See* Chart 2058b, Track F (eastbound).

Distances from Halifax are:—

To Fastnet by (a), 2,362 miles; by (b), 2,212 miles; by (c), 2,185 miles.

To Bishop rock by (a), 2,482 miles; by (b), 2,341 miles; by (c), 2,314 miles.

Route 192. Halifax to Pauillac (Bordeaux)

Follow the tracks given in Route 191, according to season, to the positions, (a), lat. 42° 00′ N., long. 50° 00′ W.; (b), lat. 45° 25′ N., long. 50° 00′ W.; (c), 25 miles south of Cape Race., thence, in each case, take the Great Circle track to the mouth of Estuaire de la Gironde, and thence proceed to destination.

Distance from Halifax to Pauillac: by (a), 2,753 miles; by (b), 2,634 miles; by (c), 2,626 miles.

Route 193. Halifax to Gibraltar, Vigo, and Lisbon

(1) To GIBRALTAR.

(a) April 11th to June 30th (both days inclusive).—Steer on Rhumb line courses, first to a point 60 miles south of Sable island; thence to lat. 40° 30′ N., long. 47° 00′ W.; thence take a Great Circle track to a position 10 miles south of Cape St. Vincent; thence on Rhumb line courses, as navigation permits, to destination.

(b) July 1st to April 10th (both days inclusive).—Steer on Rhumb line courses, first to a point 60 miles south of Sable island; thence to lat. 42° 00′ N., long. 50° 00′ W.; thence on a Great Circle track to a position 10 miles south of Cape St. Vincent; thence on Rhumb line courses, as navigation permits, to destination.

(2) To VIGO.—Follow the routes given in (1) (a) and (b), according to season, for Gibraltar, but leave them on reaching 30° W., longitude; (1) (a) in about lat. 40° 30′ N. and (1) (b) in about lat. 41° 28′ W.; proceed thence by Great Circle to Vigo.

(3) To LISBON.—Follow the routes given in (1) (a) and (b), according to season, for Gibraltar, but leave them on reaching 15° W. longitude; (1) (a) in about lat. 38° 28′ N. and (1) (b) in about lat. 38° 43′ N.; proceed thence, as directly as navigation will allow to Lisbon.

Distances from Halifax are:—

To Gibraltar by (1) (a), 2,756 miles; by (1) (b), 2,730 miles.

To Vigo by (2), using (1) (a), 2,517 miles; by (2), using (1) (b), 2,484 miles.

To Lisbon by (3), using (1) (a), 2,542 miles; (3), using (1) (b), 2,511 miles.

Route 194. Halifax to Arquipélago dos Açôres

Proceed on the Great Circle track direct.

Distance from Halifax to Horta, 1,608 miles; to Ponta Delgada, 1,753 miles.

Route 195. Halifax to Dakar

Proceed by Rhumb line tracks to a position in lat. 43° 00′ N., long. 60° 00′ W., 60 miles south of Sable island; thence follow the Great Circle track to Cap Vert (Cape Verde) and so to Dakar.

Distance from Halifax to Dakar, 2,955 miles.

Route 196. Halifax to Arquipélago de Cabo Verde, to West African ports and to Cape Town

In all cases follow the reverse of the routes described in Chapter II, and summarised below. *See African Pilot, Part I, and II.*

(1) To ARQUIPÉLAGO DE CABO VERDE (São Vicente).—Route 119. *Distance, see* below.

(2) To CAPE TOWN.—Route 160. *Distance, see* below.

(3) To WEST AFRICAN PORTS.—Routes 136 and 137. *Distances, see* below.

Distances from Halifax are:—

To Accra, 4,290 miles; to Banana Creek (Congo R.), 5,185 miles; to Cape Town, 6,505 miles; to Douala, 4,881 miles; to Lagos, 4,510 miles; to Lobito, 5,465 miles; to São Vicente, 2,564 miles; to Takoradi, 4,190 miles.

Route 197. Halifax to ports in Gulf of Mexico or Caribbean sea, and to Bermuda. *See West Indies Pilot, Vols. I, II, and III.*

See also General remarks on navigation in Gulf of Mexico and Caribbean sea, which will be found at the beginning of sub-section (iv) of Chapter III, Part I, on page 69.

(1) To GULF OF MEXICO AND CARIBBEAN SEA.

(a) By Providence channels.—Proceed by Rhumb line direct to lat. 25° 50′ N., long. 77° 00′ W., in the eastern entrance to North-east Providence channel, and thence continue to destination. *See* Route 88.

Note.—A strong contrary current will be encountered during the last 200 miles of the passage to lat. 25° 50′ N., long. 77° 00′ W.

(b) By Windward passage.—Proceed by Rhumb line tracks to lat. 20° 10′ N., long. 74° 00′ W., about 10 miles east of Cabo Maysi, the eastern extreme of Cuba, either by Crooked Island passage or by Caicos passage (the former is recommended for a night passage), and thence continue to destination. *See* Route 89.

(c) By Mona passage.—Proceed by Rhumb line tracks to lat. 18° 20′ N., long. 68° 00′ W., 12 miles N.N.W. of Mona island, and thence continue to destination. *See* Route 90.

(d) By Sombrero Island passage.—Proceed by Rhumb line tracks to lat. 18° 35′ N., long. 63° 50′ W. in the middle of Sombrero Island passage; thence continue to destination. *See* Route 91.

(2) To BERMUDA.—Take the Rhumb line track direct.

Distances from Halifax are:—

To N.E. Providence channel, 1,310 miles; to Windward passage by Crooked Island passage, 1,593 miles, by Caicos passage, 1,577 miles; to Mona passage, 1,596 miles; to Sombrero Island passage, 1,565 miles; to Bermuda, 753 miles.

Route 198. Halifax to Recife, to Rio de Janeiro and to Rio de La Plata

Follow the Great Circle track to lat. 4° 40′ S., long. 34° 35′ W., about 60 miles north-east of Cabo San Roque, making full allowance for the equatorial current setting across the track, and thence continue to destination as directly as prudent navigation will allow.

See General remarks at the beginning of sub-section (vi) of this Chapter, on page 72.

Distance from Halifax to Recife, 3,540 miles; to Rio de Janeiro, 4,613 miles; to Rio de La Plata (entrance), 5,605 miles.

Route 199.—*Reserved as spare.*

Route 200.—*Reserved as spare.*

(iii) ROUTES FROM EAST COAST OF UNITED STATES

See General remarks and Cautions at the beginning of Chapter II on page 41.

Route 201. New York to Reykjavik

(a) By Cape Race.—Proceed by Rhumb line tracks first to lat. 40° 10′ N., long. 70° 00′ W., thence to lat. 43° 00′ N., long. 60° 00′ W., 60 miles south of Sable island, and thence to lat. 46° 12′ N., long. 53° 05′ W., 25 miles south of Cape Race. From thence follow the Great Circle track to Reykjavik.

(b) By Strait of Belle Isle.—Proceed by Rhumb line tracks, to pass south of Nantucket shoals, through Cabot strait (or Gut of Canso), and through Strait of Belle Isle; thence follow the Great Circle track to Reykjavik.

Note.—Ships with local knowledge can pass through Nantucket Sound and thus reduce the total distance by 19 miles.

Distance from New York to Reykjavik by (a), 2,501 miles; by (b), 2,451 miles.

Notes.—Ice: General information about the probable ice conditions on these routes will be found in Nova Scotia and Bay of Fundy, Newfoundland and Labrador, and Arctic (Vol. II) Pilots.

Local magnetic anomaly has been reported off the south coast of Iceland.

See Section D. Part I. Index on pages 340 and 341.

Route 202. New York to Nordkapp

Follow, according to season, Route 204 (a), (b), or (c), below, to lat. 57° 50′ N., long. 18° 00′ W., and then take the Great Circle track to Nordkapp.

Distance from New York to Nordkapp, using 204 (a), 4,133 miles; using 204 (b), 4,077 miles; using 204 (c), 3,962 miles.

Route 203. New York to Trondheim and Bergen

(1) To TRONDHEIM. *See* Note below.

(*a*).—Follow Rhumb line tracks to lat. 40° 10′ N., long. 70° 00′ W, and thence to lat. 40° 30′ N., long. 47° 00′ W.; thence proceed on a Great Circle to a position 10 miles south of the Færöes, and thence by Rhumb line tracks to Trondheim.

(*b*).—Follow Rhumb line tracks to lat. 40° 10′ N., long. 70° 00′ W., and thence to lat. 42° 00′ N., long. 50° 00′ W.; thence proceed on a Great Circle to a position 10 miles south of Færöes, and thence by Rhumb line tracks to Trondheim.

(*c*).—Follow Rhumb line tracks first to lat. 40° 10′ N., long. 70° 00′ W., thence to lat. 43° 00′ N., long. 60° 00′ W., 60 miles south of Sable island, and thence to lat. 46° 12′ N., long. 53° 05′ W., 25 miles south of Cape Race; thence proceed by a Great Circle track direct to lat. 63° 18′ N., long. 7° 40′ E., in the Grip-Holen approach to Tronheim.

(2) To BERGEN. *See* Note below.

(*a*).—Proceed as in (1) (a) above to lat. 40° 30′ N., long. 47° 00′ W., and thence follow a Great Circle track to Sumburgh head (Shetland); thence steer on Rhumb line tracks to Bergen.

(*b*).—Proceed as in (1) (b) above to lat. 42° 00′ N., long. 50° 00′ W., and thence follow a Great Circle track to Sumburgh head (Shetland); thence steer on Rhumb line tracks to Bergen.

(*c*).—Proceed as in (1) (c) above, to lat. 46° 12′ N., long. 53° 05′ W., 25 miles south of Cape Race, and thence follow a Great Circle track to Sumburgh head (Shetland); thence steer on Rhumb line tracks to Bergen.

Distances from New York (Ambrose light vessel) are:—

To Trondheim by (1) (a), 3,658 miles; by (1) (b), 3,526 miles; by (1) (c), 3,330 miles.

To Bergen, by (2) (a), 3,480 miles; by (2) (b), 3,360 miles; by (2) (c), 3,194 miles.

Note.—The choice of the routes given above should be decided by the North Atlantic Lane Route in force. *See* General remarks and Cautions at the beginning of Chapter II. on page 41.

Route 204. New York or Boston to Cape Wrath

(a) Extra Southern (Only brought into operation when necessity arises).—Proceed by Rhumb line tracks from New York to lat. 40° 10′ N., long. 70° 00′ W., and thence to lat. 39° 30′ N., long. 47° 00′ W.; or from Boston light vessel to lat. 39° 30′ N., long. 47° 00′ W. direct; thence follow a Great Circle track to lat. 57° 50′ N., long. 18° 00′ W., and thence by Great Circle, or Rhumb line, to Cape Wrath.

(b) April 11th to June 30th (inclusive), except when ice conditions necessitate the use of the Extra Southern route.—Proceed by Rhumb line tracks from New York to lat. 40° 10′ N., long. 70° 00′ W., and thence to lat. 40° 30′ N., long. 47° 00′ W.; or from Boston light vessel to lat. 40° 30′ N., long. 47° 00′ W. direct; thence follow a Great Circle track to lat. 57° 50′ N., long. 18° 00′ W., and thence by Great Circle, or Rhumb line, to Cape Wrath.

(c) July 1st to April 10th (inclusive), except when ice conditions necessitate the use of route (b) above.—Proceed by Rhumb line tracks from New York to lat. 40° 10′ N., long. 70° 00′ W., and thence to lat. 42° 00′ N., long. 50° 00′ W.; or from Boston light vessel to lat. 42° 00′ N., long. 50° 00′ W. direct; thence follow a Great Circle track to lat. 57° 50′ N., long. 18° 00′ W., and thence by Great Circle or Rhumb line to Cape Wrath.

Distance from New York (Ambrose light vessel) to Cape Wrath by (a), 3,218 miles; by (b), 3,162 miles; by (c), 3,036 miles.

Distance from Boston light vessel to Cape Wrath, by (a), 3,072 miles; by (b), 3,008 miles; by (c), 2,872 miles.

Route 205. New York or Boston to Inishtrahull

At all season of the year, if from New York, steer first for a position about 30 miles southward of Nantucket light vessel, in lat. 40° 10′ N., long. 70° 00′ W.; thence, or from Boston light vessel, proceed as follows, according to season.

(a) Extra Southern.—Only brought into operation when necessity arises.—Steer on a Rhumb line to lat. 39° 30′ N., long. 47° 00′ W., and thence on a Great Circle to Inishtrahull. *See* Admiralty Chart 2058c, Track A (eastbound).

(b) April 11th to June 30th (inclusive), except when ice conditions necessitate the use of the Extra Southern route.—Steer by Rhumb line to lat. 40° 30′ N., long. 47° 00′ W., and thence by Great Circle to Inishtrahull.—*See* Admiralty Chart 2058c., Track B (eastbound).

(c) July 1st to April 10th (inclusive), except when ice conditions necessitate the use of route (b) above.—Steer on a Rhumb line to lat. 42° 00′ N., long. 50° 00′ W., and thence by Great Circle to Inishtrahull. *See* Admiralty Chart 2058c, Track C (eastbound).

Distance from New York (Ambrose light vessel) to Inishtrahull by (a), 3,076 miles; by (b), 3,026 miles; by (c), 2,925 miles.

Distance from Boston light vessel to Inishtrahull by (a), 2,930 miles; by (b), 2,822 miles; by (c), 2,761 miles.

Route 206. New York or Boston to Fastnet and Bishop rock

At all seasons of the year, if from New York, steer first for a position about 30 miles southward of Nantucket light vessel, in lat. 40° 10′ N., long. 70° 00′ W.; thence, or from Boston light vessel, proceed as follows, according to season.

(a) Extra Southern.—Only brought into operation when necessity arises.—From the position in lat. 40° 10′ N., long. 70° 00′ W., or from Boston light vessel, steer on a Rhumb line to lat. 39° 30′ N., long. 47° 00′ W., and thence on a Great Circle to Fastnet, or to Bishop rock. *See* Admiralty Chart 2058b, Track A (eastbound).

(b) April 11th to June 30th (both days inclusive), except when ice conditions necessitate the use of Track A.—From the position in lat. 40° 10′ N., long. 70° 00′ W., or from Boston light vessel, steer on a Rhumb line to lat. 40° 30′ N., long. 47° 00′ N., and thence on a Great Circle to Fastnet, or to Bishop rock. *See* Admiralty Chart 2058b, Track B (eastbound).

(c) July 1st to April 10th (both days inclusive), except when ice conditions necessitate the use of Track B.—From the position in lat. 40° 10′ N., long. 70° 00′ W., or from Boston light vessel, steer on a Rhumb line to lat. 42° 00′ N., long. 50° 00′ W., and thence on a Great Circle to Fastnet, or to Bishop rock. *See* Admiralty Chart 2058b, Track C (eastbound).

Note.—The courses across the Atlantic should be made nothing to the northward of the actual Great Circle track.

Distance from New York (Ambrose light vessel) to Fastnet by (a), 2,941 miles; by (b), 2,898 miles; by (c), 2,818 miles; to Bishop rock by (a), 3,050 miles; by (b), 3,009 miles; by (c), 2,938 miles.

Distance from Boston light vessel to Fastnet by (a), 2,795 miles; by (b), 2,744 miles; by (c), 2,654 miles; to Bishop rock by (a), 2,904 miles; by (b), 2,855 miles; by (c), 2,774 miles.

See Notes and Cautions at the end of Route 178.

Route 207. New York or Boston to Pauillac (Bordeaux)

Follow the tracks given in Route 206 above, according to season, to the following positions: (a), lat. 39° 30′ N., long. 47° 00′ W.; (b), lat. 40° 30′ N., long. 47° 00′ W.; (c), lat. 42° 00′ N., long. 50° 00′ W. ;thence, in each case follow a Great Circle track to the mouth of Estuaire de la Gironde, and thence proceed to destination. *See Bay of Biscay Pilot.*

Distances to Pauillac by the different routes are:—

From New York (Ambrose light vessel), by (a), 3,296 miles; by (b), 3,263 miles; by (c), 3,209 miles,

From Boston light vessel by (a), 3,150 miles; by (b), 3,103 miles; by (c), 3,045 miles.

Route 208. New York or Boston to Gibraltar, Vigo and Lisbon.—*See West Coast of Spain and Portugal Pilot*, and Caution at the beginning of sub-section (v), in Chapter II, on page 52.

(1) To GIBRALTAR.—At all seasons of the year, steer first for a point about 30 miles southward of Nantucket light vessel, in lat. 40° 10′ N., long. 70° 00′ W.; and thence as follows, according to season.

(a) April 11*th to June* 30*th (both days inclusive).*—From a position in lat. 40° 10′ N., long. 70° 00′ W., or from Boston light vessel, steer on a Rhumb line to lat. 40° 30′ N., long. 47° 00′ W., thence on a Great Circle to a position 10 miles south of Cape St. Vincent; thence, as navigation permits, to destination.

(b) July 1*st to April* 10*th (both days inclusive).*—From a position in lat. 40° 10′ N., long. 70° 00′ W., or from Boston light vessel, steer on a Rhumb line to lat. 42° 00′ N., long. 50° 00′ W.; thence on a Great Circle to a position 10 miles south of Cape St. Vincent; thence, as navigation permits, to destination.

(2) To VIGO.—Take the routes for Gibraltar, according to season, given in (1) (a) and (b), and on reaching long. 30° 00′ W. ((1) (a) in about lat. 40° 30′ N. and (1) (b) in about lat. 41° 28′ N.), leave the Great Circle, and steer on a second Great Circle for destination.

(3) To LISBON.—Take the routes for Gibraltar, according to season, given in (1) (a) and (b), and on reaching long. 15° 00′ W. ((1) (a) in about lat. 38° 28′ N. and (1) (b) in about lat. 38° 43′ N.), leave the Great Circle and steer direct for Lisbon.

Distances to Gibraltar are:—

From New York (Ambrose light vessel), by (a), 3,199 miles; by (b), 3,185 miles.

From Boston light vessel, by (a), 3,045 miles; by (b), 3,021 miles.

Distances to Vigo are:—

From New York (Ambrose light vessel), by (a), 2,969 miles; by (b), 2,934 miles.

From Boston light vessel, by (a), 2,815 miles; by (b), 2,770 miles.

Distances to Lisbon are:—

From New York (Ambrose light vessel), by (a), 2,985 miles; by (b), 2,966 miles.

From Boston light vessel, by (a), 2,831 miles; by (b), 2,802 miles.

Route 209. New York to Arquipélago dos Açôres, Madeira and Islas Canarias

In each case, and at all seasons, follow Rhumb line tracks to lat. 40° 10′ N., long. 70° 00′ W., and thence the Great Circle track direct to destination.

Distance from New York (Ambrose light vessel) to Horta, 2,099 miles; to Las Palmas, 2,959 miles; to Madeira, 2,761 miles; to Ponta Delgada, 2,246 miles.

Route 210. New York to Arquipélago de Cabo Verde, Casablanca, Dakar, Sierra Leone, Ascension and St. Helena.

In all cases follow the reverse of the route described in Chapter II, as summarised below.

(1) To São Vicente (Arquipélago de Cabo Verde).—Route 119. *Distance*, 2,912 miles. Page 56.

(2) To CASABLANCA.—Route 95. *Distance*, 3,175 miles. Page 54.

(3) To DAKAR.—Route 127 (2). *Distance*, 3,334 miles. Page 57.

(4) To SIERRA LEONE.—Route 131. *Distance*, 3,763 miles. Page 58.

(5) To ASCENSION.—Route 140. *Distance*, 4,396 miles. Page 58.

(6) To ST. HELENA.—Route 148. *Distance*, 5,093 miles. Page 59.

Note.—The distances are from Ambrose light vessel.

Route 211. New York to ports on the West Coast of Africa east and south of Sierra Leone.

In each case follow the Great Circle track to São Vicente *(See* Route 210 above), and thence steer to destination as directly as navigation permits.

Distances from New York (Ambrose light vessel) are:—

To Accra, 4,649 miles; to Banana Creek (Congo R.), 5,544 miles; to Douala, 5,240 miles; to Lagos, 4,869 miles; to Lobito, 5,824 miles; to Takoradi, 4,549 miles.

Route 212. New York to Cape Town

(a) Direct route.—Follow the direct Great Circle track, crossing the equator at 20° 40′ W. long., and passing about 50 miles north-east of Ascension, and about 20 miles north-east of St. Helena.

(b) Alternative route, via Arquipélago de Cabo Verde.—Proceed on the Great Circle track to São Vicente (Arquipélago de Cabo Verde) (where fuel may be obtained) and thence by a second Great Circle track to Cape Town. By this route, much adverse current is avoided.

See Navigational Note at the end of Route 48.

Distance from New York (Ambrose light vessel) to Cape Town by (a), 6,787 miles; by (b), 6,853 miles.

Route 213. New York to Recife, and to ports on the east coast of South America south of Recife

Follow the Great Circle track to lat. 4° 40′ S., long. 34° 35′ W., about 60 miles north-east of Cabo San Roque, making full allowance for the equatorial current setting across the track, and thence proceed to destination as directly as prudent navigation will allow.

Note.—For directions for the latter part of the passages, after making the land off Recife, *see* South America Pilot, Part I, and General remarks at the beginning of sub-section (vi), Chapter III, on page 72.

Distances from New York (Ambrose light vessel) are:—

To Bahia Blanca, 6,120 miles; to Magallanes, Estrecho de (Dungeness), 6,806 miles; to Recife, 3,670 miles; to Rio de Janeiro, 4,743 miles; to Rio de La Platá, 5,735 miles; to Pôrto do Salvador (Baia), 4,057 miles.

Route 214. New York to Rio Amazonas

(a) November to June.—Follow the Great Circle track direct.

(b) July to October (via Bermuda).—During this, the hurricane season, a track about 150 to 200 miles eastward of the Great Circle track is advisable. The first course should pass Bermuda closely; and cross long. 60° 00′ W. at lat. 26° 00′ N., thence to cross long. 50° 00′ W. at lat. 11° 00′ N.; thence to cross long. 47° 30′ W. at lat. 6° 40′ N., and thence to destination, making full allowance for the Equatorial current across the track.

Note.—In approaching Bermuda make allowance for the Gulf stream. Squally weather is frequent within the limits of the stream, and fog is prevalent on its northern border.

Distance from New York (Ambrose light vessel) to a position 10 miles north of Ponta Tijoca, at the entrance to Rio Para, by (a), 2,855 miles; by (b), via Bermuda, 2,880 miles.

Distance from New York (Ambrose light vessel) to Bermuda, 693 miles.

Route 215. New York to Barbados and Trinidad

(1) To Barbados.—Take the Rhumb line track direct to Barbados, passing eastward of Barbuda, and thence proceed by courses as direct as navigation permits, allowing for the Equatorial current setting across the track.

When making Barbados, during hours of darkness, it is advisable to make Ragged point light, as the low-lying north end of the island is difficult to pick up.

(2) To Trinidad.—Follow a Rhumb line to Sombrero Island passage, and thence continue as directly as navigation permits to Port of Spain.

Distance from New York (Ambrose light vessel) to Barbados, 1,825 miles; to Trinidad, 1,932 miles; to Sombrero Island passage, 1,436 miles.

Route 216. New York to Curaçao

Follow a Rhumb line to Mona passage and thence continue as direct as navigation permits to destination, making full allowance for the Equatorial current setting across the track.

Distance from New York (Ambrose light vessel), to Curaçao, 1,770 miles; to Mona passage, 1,900 miles.

Route 217. New York to Habana

(a) By Crooked Island passage.—Follow Rhumb line tracks, to lat. 24° 05′ N., long. 74° 15′ W., east of San Salvador island, and through Crooked Island passage (between Long island and Crooked island), Old Bahama channel and Nicolas channel to Habana.

(b) By Providence channels.—Follow Rhumb line tracks to lat. 25° 50′ N., long. 77° 00′ W., in entrance to N.E. Providence channel, and thence through Providence channels and Florida strait to Habana.

Note.—A contrary current of 1½ to 2 knots will be encountered during the last 200 miles of this passage.

Distance from New York (Ambrose light vessel) to Habana by (a), 1,592 miles; by (b), 1,291 miles.

Route 218. New York to Colon (Panama canal), Kingston and Belize

(a) By Crooked Island passage.—Follow Rhumb line tracks to lat. 24° 05′ N., long. 74° 15′ W., east of San Salvador island, and through Crooked Island passage to lat. 20° 10′ N., long. 74° 00′ W. (about 7 miles off Cabo Maysi, Cuba) in the Windward passage; thence proceed to destination as directly as prudent navigation will allow. *See* Route 89 (2) and (3).

(b) Alternative route (to Belize).—Follow Route 217 (b) to Habana (by Providence channels), and steer thence to Belize as directly as prudent navigation will allow.

Note.—Less adverse currents will be encountered if, first the west coast of Cuba, and then the east coast of Yucatan are kept as close aboard as safety permits.

Distance from New York (Ambrose light vessel): To Belize by (a), 2,166 miles; by (b), 1,790 miles; to Colon (Panama Canal), 1,974 miles; to Kingston (Jamaica), 1,472 miles; to position off S. Salvador, 996 miles; to position off C. Maysi, 1,240 miles.

Route 219. New York to ports in Gulf of Mexico

Proceed by Rhumb line tracks to lat. 25° 50′ N., long. 77° 00′ W., in the eastern entrance to Northeast Providence channel; thence hug closely the reefs round the southern end of the penisula of Florida, so as to keep out of the Gulf stream and be in the south-going counter current, to a position off the Dry Tortugas reefs in lat. 24° 25′ N., 83° 00′ W.; from thence proceed as direct to destination as navigation permits. *See* also Route 88.

Distances from New York (Ambrose light vessel) are:—

To Coatzacoalcos, 2,038 miles; to Galveston, 1,993 miles; to Mobile, 1,766 miles; to New Orleans (entrance to S.W. Pass), 1,719 miles; to Pensacola, 1,728 miles; to Tampico, 2,128 miles; to Vera Cruz, 2,090 miles.

See also General remarks at the beginning of subsection (iv), Chapter III, on page 69.

Route 220.—*Reserved as spare.*

Route 221. Philadelphia and Chesapeake bay (Baltimore and Newport News) to British Isles and North sea

For the passages from Philadelphis to the entrance of Delaware bay, and from Baltimore and Newport News to the entrance to Chesapeake bay, *see* East Coast of United States Pilot, Vol. II. *See also* " General Remarks " at the beginning of Chapter II., on page 41, and the notes after Route 178.

(a) April 11th to June 30th.—From Delaware bay entrance, or Chesapeake bay entrance follow Great Circles to lat. 40° 30′ N., long. 47° 00′ W., thence, if bound round north of Scotland, follow Great Circle tracks first to lat. 57° 50′ N., long. 18° 00′ W., and then to Cape Wrath; if bound round north of Ireland, proceed by Great Circle to Inishtrahull; if bound to Cobh, Dun Laoghaire or Liverpool, proceed by Great Circle to Fastnet; if bound for ports in the Bristol channel, proceed by Great Circle to a position 10 miles north of Lundy island; if bound to ports in the English channel or the south part of the North sea, proceed by Great Circle to Bishop rock.

(b) July 1st to April 10th.—From Delaware bay entrance, or Chesapeake bay entrance proceed by a Great Circle track to lat. 42° 00′ N., long. 50° 00′ W., and thence if bound:

(i) To Cape Wrath.—By a second Great Circle to lat. 57° 50′ N., long. 18° 00′ W., and thence either by Great Circle, or Rhumb line to Cape Wrath.

(ii) To Inishtrahull, Fastnet, or Bishop rock.—By a second Great Circle track to either of these places.

Distances from Philadelphia are:—

By route (a).—To Bishop rock, 3,167 miles; to Cape Wrath, 3,320 miles; to Fastnet, 3,056 miles; to Inishtrahull, 3,184 miles; to Lundy I. (10 miles north of), 3,239 miles.

The distances from Chesapeake bay entrance are 20 miles *less* than the above in each case.

By route (b).—To Bishop rock, 3,093 miles; to Cape Wrath, 3,191 miles; to Fastnet, 2,973 miles; to Inishtrahull, 3,080 miles.

The distances from Chesapeake bay entrance are 7 miles *less* than the above in each case.

Route 222. Philadelphia and Chesapeake bay to Vigo, Lisbon or Gibraltar.—*See General note at the beginning* of sub-section (v), Chapter II, on page 52.

(*a*) *Direct route.*—From Delaware bay entrance, or Chesapeake bay entrance, follow the Great Circle tracks direct, either to Ria de Vigo, or to the entrance of the Tagus River, or, if bound to Gibraltar, to lat. 36° 55′ N., long. 9° 05′ W., off Cape St. Vincent, and thence continue to destination as directly as navigation will allow.

Note.—The above Great Circles reach their farthest north points in approximately the following positions:

Philadelphia to Vigo, in lat. 45° 40′ N., long. 37° 00′ W.
Philadelphia to Lisbon, in lat. 43° 40′ N., long. 42° 30′ W.
Philadelphia to Gibraltar, in lat. 42° 50′ N., long. 45° 00′ W.
Chesapeake bay to Vigo, in lat. 45° 10′ N., long. 34° 30′ W.
Chesapeake bay to Lisbon, in lat. 42° 50′ N., long. 40° 30′ W.
Chesapeake bay to Gibraltar, in lat. 42° 00′ N., long. 43° 00′ W.

(*b*) *Low-powered steamers (from November to April.*—These vessels are recommended not to take the whole Great Circle route on account of possibly encountering heavy weather at the northernmost points of the arc, but to take a first Great Circle course to lat. 41° 00′ N., long. 47° 00′ W., and a second Great Circle course thence to destination.

Note.—The farthest north points on the three routes will be: to Vigo, lat. 43° 15′ N., long. 23° 30′ W.; to Lisbon, lat. 41° 35′ N., long. 35° 30′ W.; to Gibraltar, lat. 41° 10′ N., long. 40° 30′ W.

Distances are as follows:—

By (a): To Vigo, from Philadelphia, 3,047 miles; from Chesapeake bay (entrance), 3,046 miles. To Lisbon, from Philadelphia, 3,103 miles; from Chesapeake bay (entrance), 3,096 miles. To Gibraltar, from Philadelphia, 3,339 miles; from Chesapeake bay (entrance), 3,330 miles.

By (b): To Vigo, from Philadelphia, 3,092 miles; from Chesapeake bay (entrance), 3,074 miles. To Lisbon, from Philadelphia, 3,122 miles; from Chesapeake bay (entrance), 3,104 miles. To Gibraltar, from Philadelphia, 3,351 miles; from Chesapeake bay (entrance), 3,339 miles.

Route 223. Philadelphia and Chesapeake bay to Arquipélago dos Açôres, Madeira, Islas Canarias or Arquipélago de Cabo Verde

From Delaware bay entrance, or Chesapeake bay entrance, follow the direct Great Circle track, at all seasons, to each destination.

Distances are as follows:—

To Horta, Faial (Fayal), from Philadelphia, 2,242 miles; from Chesapeake bay, 2,225 miles.
To Ponta Delgada, São Miguel, from Philadelphia, 2,387 miles; from Chesapeake bay, 2,371 miles.
To Madeira, from Philadelphia, 2,899 miles; from Chesapeake bay, 2,877 miles.
To Las Palmas, Gran Canaria, from Philadelphia, 3,092 miles; from Chesapeake bay, 3,062 miles.
To São Vicente, from Philadelphia, 3,011 miles; from Chesapeake bay, 2,944 miles.

Route 224. Chesapeake bay to Cape Town and ports on West Coast of Africa.—*See* Navigational Note regarding the Approaches to Cape Town. under Route 48 (a), on page 49.

(*a*) *Direct route.*—Follow the Great Circle track direct.

(*b*) *By São Vicente (Arquipélago de Cabo Verde).*—São Vicente lies so close to the most direct route from Chesapeake bay or Delaware bay to ports on the west coast of Africa that the total distances, except in the cases given for (a), below, are only increased by about 25 miles if a call is made at that port. The route is by Great Circle to São Vicente, and thence as given under Routes 124 and 125.

Distances from Chesapeake bay are:—

To Cape Town, by (a), 6,764 miles; by (b), 6,885 miles; to Dakar, by (a), 3,379 miles; by (b), 3,409 miles. To Lobito, by (a), 5,822 miles; by (b), 5,879 miles.

Other distances by (b), above, are:—

To Accra, 4,703 miles; to Banana Creek (Congo R.), 5,599 miles; to Bathurst, 3,471 miles; to Conakry, 3,767 miles; to Douala, 5,294 miles; to Lagos, 4,923 miles; to São Vicente, 2,944 miles; to Sierra Leone, 3,820 miles; to Takoradi, 3,603 miles.

Route 225. Chesapeake bay to ports in Gulf of Mexico

Follow Rhumb line tracks to lat. 25° 50′ N., long. 77° 00′ W., in eastern entrance to North-East Providence channel, and thence through Providence channels to Dry Tortugas and destination as detailed in Route 88.

Note.—Directions for the passage southward from Chesapeake bay are given in East Coast of United States Pilot, Vol. II, and West Indies Pilot, Vol. III. It should be noted that if the approach to the Gulf of Mexico is made through the Florida strait between Jupiter inlet and Little Bahama bank, the above distances are reduced by about 134 miles, but a more adverse current will be encountered on the passage.

Distances from Chesapeake bay are:—

To Coatzacoalcos, 1,812 miles; to Galveston, 1,767 miles; to Mobile, 1,540 miles; to New Orleans (entrance to S.W. Pass), 1,493 miles; to N.E. Providence channel entrance, 685 miles; to Pensacola, 1,502 miles; to Tampico, 1,902 miles; to Vera Cruz, 1,864 miles.

Route 226. Chesapeake bay to Colon (Panama Canal), to Kingston (Jamaica), and to Belize (British Honduras).

(*a*) *By Crooked Island passage.*—Follow Rhumb line tracks to lat. 24° 05′ N., long. 74° 15′ W., east of San Salvador island, and thence continue through Crooked Island passage to destination as given in Route 218 (a).

(*b*) *By Providence channels (to Belize only).*—Follow by Rhumb line tracks to lat. 25° 50′ N., long. 77° 00′ W., N.E. Providence channel, and thence to Belize as detailed in Route 218 (b).

Distance from Chesapeake bay to Belize by (a), 1,946 miles, by (b), 1,444 miles; to Colon, 1,752 miles; to Kingston, 1,252 miles.

Route 227. Chesapeake bay to Curaçao and ports in eastern part of Caribbean sea

Follow Rhumb line tracks to lat. 18° 20′ N., long. 68° 00′ W., 12 miles N.N.W. of Mona island, and thence through Mona passage; thence proceed to destination (*see* Route 90), as directly as prudent navigation will allow, noting the westerly or west-north-westerly current which sets across the greater part of this passage.

Distance from Chesapeake bay to Mona island, 1,214 miles; to Curaçao, 1,582 miles.

Route 228. Chesapeake bay to Trinidad

Follow Rhumb line tracks direct to lat. 18° 35′ N., long. 63° 50′ W., in middle of Sombrero Island passage, and thence proceed to Trinidad as directly as prudent navigation will allow.

Distance from Chesapeake bay to Sombrero Island passage, 1,283 miles; to Trinidad, 1,780 miles.

Note.—The voyage may be made equally well by either Virgin passage, or Mona passage, the distance from Chesapeake bay to Trinidad then being 1,768 or 1,794 miles respectively.

Route 229. Chesapeake bay to Rio Amazonas (River Amazon)

(a) November to June.—Follow the Great Circle track direct to a position 10 miles north of Ponta Tijoca (at entrance to Rio Para).

(b) July to October (By Bermuda).—During the hurricane season from July to October, a track about 150 to 200 miles eastward of the Great Circle is advisable, first making directly for Bermuda, and then passing through lat. 26° 00′ N., long. 60° 00′ W., lat. 11° 00′ N., long. 50° 00′ W., and lat. 6° 40′ N., long. 47° 30′ W., and thence proceeding direct to destination. *See Note* under Route 214.

Distance from Chesapeake bay to Rio Para, by (a), 2,737 miles; by (b), 2,830 miles; to Bermuda, 640 miles.

Route 230. Chesapeake bay to Recife (Pernambuco) and to Ports on East Coast of South America, south of Recife

At all seasons, follow the Great Circle track direct to lat. 4° 40′ S., long. 34° 35′ W., about 60 miles north-east of Cabo San Roque, making full allowance for the equatorial current setting across the track; thence proceed to destination as directly as prudent navigation will allow.

Note.—For directions for the latter part of the passages, after making the land off Recife, *see South America Pilot, Part I.*, and also the relevant parts of Route 113 and General Remarks at the beginning of sub-section (vi), Chapter III, on page 72.

Distances from Chesapeake bay are:—

To Bahia Blanca, 6,038 miles; to Magallanes, Estrecho de, 6,724 miles; to Recife, 3,588 miles; to Rio de Janeiro, 4,661 miles; to Rio de La Plata (entrance) (in lat. 35° 10′ S., long. 56° 26′ W), 5,653 miles; to Salvador (Baia), Pôrto do, 3,975 miles; to Santos, Porto de, 4,848 miles.

Route 231. *Reserved as spare.*

(iv) ROUTES FROM PORTS IN GULF OF MEXICO AND IN CARIBBEAN SEA

General remarks on Navigation

(1) The Routes between ports in these waters are all as direct as navigation permits, with one exception, due to seasonal changes in the direction of the currents in the Strait of Yucatan, namely, on a passage from New Orleans to Colon, from September to April, when Cabo San Antonio (western extreme of Cuba) should be rounded as closely as navigation permits, but from May to August it should be passed at about 20 miles distance.

(2) On the passage from Colon to New Orleans the route through Yucatan strait is, at all seasons, on the opposite side of the channel; namely, at 40 miles distance from C. Catoche, and the eastern extreme of Yucatan peninsula.

(3) Bound to and from the southern Mexican oil ports, pass southwards, both ways, of Arrecife de Alacranes (Alacran reef) (*Lat. 22° 24′ N., Long. 89° 42′ W.*).

(4) Bound eastward from the oil ports through the Caribbean sea to the West Indian islands, or to South America, give Cabo Catoche a wide berth, and make Cabo San Antonio (western extreme of Cuba) at a distance of 7 miles. Shape course thence along the southern side of Cuba, to sight Cabo de la Cruz and pass it at about 5 miles distance; thence pass the same distance from Navassa island (*Lat. 18° 25′ N., Long. 75° 02′ W.*) and from Pointe de Gravois (*Lat. 18° 02′ N., Long. 73° 56′ W.*), and Alta Vela (*Lat. 17° 29′ N., Long. 71° 39′ W.*), all off the south side of Haiti-San Domingo. This course will keep a vessel in a slight east-going counter-current; and also mostly under the lee of the land, in smoot water.

(5) If bound to South America from Alta Vela, steer to pass between St. Lucia and St. Vincent islands, and southwards of Barbados to a point in lat. 9° 00′ N., long. 53° 00′ W., and thence to round Cabo de San Roque at a distance of 50 miles.

(6) On the return journey from South America, keep in the strength of the Gulf stream from a point 20 miles from Cabo de San Roque, rounding Cabo Orange at a distance of 50 miles, and passing north of Jamaica to the Yucatan strait. Cabo Catoche must, as before, be given a wide berth, on account of the off-lying shoals.

(7) If bound to Tuxpam or Tampico, after passing south of Arrecife de Alacranes, steer to pass northward of Cayo Arenas.

CAUTION. The currents around Tuxpam reefs are very uncertain, and at night time, unless Tuxpam lights are in sight, it is not prudent to approach the shore into less than 15 fathoms of water.

(8) If bound to Coatzacoalcos, pass 7 miles west of the charted position of Snake rock, and 5 miles north of Cayos Arcas. Thence proceed direct to destination, always allowing for the current setting towards the shore, on approaching Coatzacoalcos.

(*See* pilot chart of the Central American waters for each month of the year published by the Hydrographic Office of the Navy Department of the United States, on which all routes and distances are laid down.).

General.—All vessels proceeding from ports in the Gulf of Mexico to ports in British Isles or Europe should first make for a point off the Dry Tortugas, in lat. 24° 25′, long. 83° 00′ W., as directly as navigation permits.

Route 232. Gulf of Mexico to United States ports or Canadian ports.—*See* Navigational Notes immediately preceding this Route.

From a position in lat. 24° 25′ N., long. 83° 00′ W. off the Dry Tortugas, pass through the Florida strait, keeping at a distance of 20 miles from the Florida coast, so as to be in the full current of the Florida, or Gulf stream, and, when clear of the strait, proceed as directly as navigation permits to destination.

Distances from ports in Gulf of Mexico to Dry Tortugas are given under Route 233.

Distances from Dry Tortugas to United States and Canadian ports are:—

To Charleston, 667 miles; to Chesapeake bay (entrance), 967 miles; to Halifax, 1,637 miles; to New York, 1,196 miles; to St. John's (Newfoundland), 2,107 miles.

Route 233. Gulf of Mexico to ports in British Isles and North Sea.—*See* Navigational notes preceding Routes 232 and under Route 178.

From all ports in the Gulf of Mexico proceed, as directly as prudent navigation will allow, to lat. 24° 25′ N., long. 83° 00′ W., off Dry Tortugas, and thence proceed through Florida strait, keeping about 20 miles from the coast of Florida so as to take full advantage of the Gulf Stream, first to lat. 30° 00′ N., long. 79° 00′ W., and then to lat. 35° 30′ N., long. 72° 40′ W.; thence as follows:

(a) April 11th to June 30th.—Proceed by Great Circle to lat. 40° 30′ N., long. 47° 00′ W., and thence, as detailed in Route 221 (a), to Cape Wrath, to Inishtrahull, to Fastnet, to Bishop rock, or to Lundy Island.

(b) July 1st to April 10th.—Proceed by Great Circle to lat. 42° 00′ N., long. 50° 00′ W., and thence to Cape Wrath, to Inishtrahull, to Fastnet, or to Bishop rock, as detailed in Route 221 (b).

Distances to Dry Tortugas *from* Gulf of Mexico ports are as follows:—

From Coatzacoalcos, 745 miles; from Galveston, 700 miles; from Mobile, 473 miles; from New Orleans (S.W. Pass entrance), 426 miles; from Pensacola, 435 miles; from Tampico, 835 miles; from Vera Cruz, 797 miles.

Distances from Dry Tortugas to points in, or off, the British Isles are as follows:—

To Bishop rock by (a), 3,977 miles; by (b), 3,927 miles.

To Cape Wrath, by (a), 4,130 miles; by (b), 4,025 miles.

To Fastnet, by (a), 3,865 miles; by (b), 3,807 miles.

To Inishtrahull, by (a), 3,994 miles; by (b), 3,914 miles.

Route 234. Gulf of Mexico to Vigo, Lisbon, or Gibraltar.—*See* Navigational Notes preceding Route 232 and Route 75.

(a) Via Florida strait.—From the Dry Tortugas pass through Florida strait (*see* Route 232) to a position in lat. 30° 00′ N., long. 79° 00′ W., thence on a Great Circle to a position south eastward of Ilha das Flores, Arquipélago dos Açôres, in lat. 39° 10′ N., long. 31° 00′ W., and thence on a second Great Circle to Vigo, or Lisbon; or, for Gibraltar, continue on the same Great Circle track.

(b) Alternative route, via Providence channels.—From the Dry Tortugas, take the route through the Providence channels to a position in lat. 25° 50′ N., long. 77° 00′ W., thence on a Great Circle to the position off Ilha das Flores, Arquipélago dos Açôres, given in (a) above, and thence on a second Great Circle to destination.

For distances from Gulf of Mexico ports to Dry Tortugas, *see* Route 233.

Distances via (a), above, from Dry Tortugas are:—To Vigo, 3,924 miles; to Lisbon, 3,917 miles; to Gibraltar, 4,132 miles.

Note.—The distances via (b), above, are some 85 miles less than via (a), but there is less benefit to be gained from the Gulf stream.

Route 235. Providence channels (lat. 25° 50′ N., long. 77° 00′ W.) to Casablanca, Madeira, Islas Canarias, or Arquipélago de Cabo Verde (Sao Vicente)

In all cases follow the reverse of the route described in Chapter II, as summarised below.

(1) To Casablanca.—Route 96 (a). *Distance* 3,581 miles.

(2) To Las Palmas (Islas Canarias).—Route 109. *Distance*, 3,271 miles.

(3) To Madeira.—Route 102. *Distance*, 3,193 miles.

(4) To São vicente (Arquipélago de Cabo Verde).—Route 120. *Distance*, 2,940 miles.

Route 236. Ports in Caribbean sea to Windward, Turk's Island, Mona, or Sombrero Island passages and to St. Vincent (West Indies) and Barbados.—*See* remarks preceding Route 232.

In all cases follow the reverse of the route described in Chapter II, as summarised below.

(1) To Windward and Turk's Island passages.—Route 89. *Distances* as in that route.

(2) To Mona passage.—Route 90. *Distances* as in that route.

(3) To Sombrero Island passage.—Route 91. *Distances* as in that route.

(4) To St.Vincent (West Indies) and Barbadoes.—Route 92. *Distances* as in that route.

Route 237. Turk's Island passage to Bishop rock, Gibraltar, or Casablanca

In all cases follow the reverse of the relevant part of the route described in Chapter II, as summarised below.

(1) To Bishop rock.—Route 40 (2). *Distance*, 3,596 miles.

(2) To Gibraltar.—Route 81 (b). *Distance*, 3,536 miles.

(3) To Casablanca.—Route 96 (b) *Distance*, 3,408 miles.

Route 238. Turk's Island passage to Pauillac (Bordeaux), Vigo, or Lisbon

(1) To Pauillac.—After passing Turk's island take the Rhumb line to lat. 36° 00′ N., long. 35° 00′ W., and thence proceed either on a single Great Circle to Pauillac, or stand on to Horta (coal only) or Ponta Delgada (coal and fuel oil) for fuel and start a Great Circle to Pauillac, thence.

(2) To Vigo or Lisbon.—For Vigo or Lisbon, from lat. 36° 00′ N., long. 35° 00′ W. (*see* (1) above), proceed on a Great Circle to destination.

Note.—The Great Circles in the above routes pass close to islands in the Arquipélago dos Açôres.

Distances from Turk's Island passage to Pauillac, 3,743 miles; to Vigo, 3,369 miles; to Lisbon, 3,333 miles.

Route 239. Mona passage to Bishop rock, West Coasts of France, Spain and Portugal, Gibraltar, Casablanca, Madeira and Islas Canarias

In all cases follow the reverse of the relevant part of the route described in Chapter II, as summarised below.

(1) To Bishop rock.—Route 41 (3) (a) or (b). *Distance*, 3,476 miles.

(2) To Pauillac.—Route 56 (c). *Distance*, 3,685 miles

(3) To Vigo.—Route 63 (a). *Distance*, 3,287 miles.

(4) To Lisbon.—Route 70 (a). *Distance*, 3,277 miles.

(5) To Gibraltar.—Route 82 (a). *Distance*, 3,452 miles.

(6) To Casablanca.—Route 96 (c). *Distance*, 3,341 miles.

(7) To Madeira.—Route 103 (a). *Distance*, 2,868 miles.

(8) To Las Palmas (Islas Canarias).—Route 110 (a). *Distance*, 2,939 miles.

Route 240. Sombrero Island passage to Bishop rock, West Coasts of France, Spain and Portugal, Gibraltar, Casablanca, Madeira, and Islas Canarias.

In all cases follow the reverse of the relevant part of the route described in Chapter II as summarised below.

(1) To Bishop rock.—Route 41 (3) (c) or (d). *Distance*, (by (c)), 3,287 miles.

(2) To Pauillac.—Route 56 (d). *Distance*, 3,501 miles.

(3) To Vigo.—Route 63 (b). *Distance*, 3,127 miles or by Great Circle direct. *Distance*, 3,120 miles).

(4) To Lisbon.—Route 70 (b). *Distance*, 3,053 miles.

(5) To Gibraltar.—Route 82 (b). *Distance*, 3,223 miles.

(6) To Casablanca.—Route 96 (d). *Distance*, 3,124 miles.

(7) To Madeira.—Route 103 (b). *Distance*, 2,651 miles.

(8) To Las Palmas (Islas Canarias).—Route 110 (b). *Distance*, 2,713 miles.

Route 241. Barbados to Bishop rock, Pauillac, Gibraltar, Arquipélago de Cabo Verde (Sao Vicente), and Sierra Leone

In all cases follow the reverse of the route described in Chapter II. as summarised below.

(1) To Bishop rock.—Route 42 (2). *Distance*, 3,405 miles.

(2) To Pauillac.—Route 56 (g). *Distance*, 3,569 miles.

(3) To Gibraltar.—Route 83. *Distance*, 3,236 miles.

(4) To São Vicente (Arquipélago de Cabo Verde). Route 121. *Distance*, 2,020 miles.

(5) To Sierra Leone.—Route 132 (1). *Distance*, 2,746 miles.

Route 242. St. Vincent (West Indies) to Arquipélago de Cabo Verde (Sao Vicente), Dakar, and Sierra Leone

In all cases follow the reverse of the route described in Chapter II. as summarised below.

(1) To São Vicente (Arquipélago de Cabo Verde). —Route 121. *Distance*, 2,100 miles.

(2) To Dakar.—Route 128 (2). *Distance*, 2,544 miles.

(3) To Sierra Leone.—Route 132 (2). *Distance*, 2,837 miles.

Route 243. Ports in the Gulf of Mexico and Caribbean sea to Cape Town

Proceed as given in (4) and (5) of the General Remarks preceding Route 232, on page 69, as far as a position about 5 miles north of St. Vincent, West Indies, in lat. 13° 28′ N., long. 61° 10′ W., and thence:—

(a) Direct route.—Follow Rhumb line tracks first to lat. 5° 00′ N., long. 45° 00′ W., and thence to lat. 4° 40′ S., long. 34° 35′ W., about 60 miles north-east of Cabo San Roque; thence proceed by Great Circle to Cape Town.

(b) Alternative route.—Some navigators prefer to keep about 100 miles farther away from the north-east coast of South America, crossing the equator in 36° 45′ W. longtitude and passing close west of Ilha de Fernando de Noronha before taking the Great Circle to Cape Town.

Note.—A current running E.S.E., at a speed of from 1 to 2 knots, is sometimes experienced between lat. 9° 30′ N., long. 56° 30′ W., and lat. 5° 00′ N., long. 43° 00′ W.

Distance from St. Vincent to Cape Town, 5,361 miles.

Route 244. Ports in Gulf of Mexico and Caribbean sea to Rio Amazonas

Proceed to lat. 13° 28′ N., long. 61° 10′ W. (5′ north of St. Vincent, W. Indies) as described in the General Remarks preceding Route 232; thence:—

(a) Direct route.—Proceed by Rhumb line to lat. 5° 50′ N., long. 47° 22′ W., and thence due south to make a landfall in lat. 0° 28′ S., long. 47° 22′ W.

CAUTIONS. Great care must be taken not to make a landfall to the westward of this position, and to make due allowance when crossing the west-going current, which is by no means constant in strength throughout the year. Fresh to strong E.S.E. winds, and a rough sea, may be expected on this voyage.

The above track lies close to the 3½ fathoms (P.D.) charted in lat. 0° 32′ N., long. 47° 24′ W.

(b) Alternative route.—Follow a curving track rounding the Guiana coast at a distance of about 100 miles, and thence to the entrance to Rio Para, as directly as prudent navigation will allow. This route is about 100 miles shorter than that given in (a), above, but it is more in the strength of the adverse equatorial current.

Distance by (a) from St. Vincent to Rio Pará, 1,296 miles.

Route 245. Ports in the Gulf of Mexico and Caribbean sea to Recife and South American ports south of Recife.—*See* South American Pilot, Parts I and II, and Navigational notes at the beginning of sub-section (iv) on page 69. *Also see* General Remarks at the beginning of sub-section (vi) on page 72.

Proceed first to a position 5 miles north of St. Vincent *(see* Route 236), and thence either by (a), or (b), below.

(a) Steer first on a Great Circle, to lat. 3° 45′ N., long. 40° 00′ W., in order to avoid as much as possible the westerly set. Cross the equator in long. 36° 45′ W., and steer to pass midway between Cabo San Roque and Atol das Rocas, making allowance for the westerly set. Thence proceed direct to Recife or to ports to the southward as directly as navigation will allow.

(b) Follow Rhumb line tracks first to lat. 5° 00′ N., long. 45° 00′ W.; thence to lat. 4° 30′ S., long. 35° 00′ W.; thence direct to Recife, or to ports to the southward as directly as navigation allows. Following this more direct route, the total distance to Recife was 2,144 miles, or 152 miles less than that in (a) above, and the average adverse current experienced was only half a knot.

Note.—A current setting to the eastward at a rate of from 1 to 2 knots is sometimes experienced during the latter half of the year (July to December), between the following approximate positions, lat. 9° 00′ N., long. 55° 00′ W. and lat.4° 00′ N., long. 42° 00′ W.

Distance from St. Vincent to Recife by (a), 2,296 miles; by (b), 2,144 miles.

Note.—The direct route distance to Recife is 2,104 miles, but is in strong contrary current the whole way.

Other distances from St. Vincent (by Route 245 (b)) are:—

To Bahia Blanca, 4,594 miles; to Magallanes, Estrecho de, 5,280 miles; to Rio de Janeiro, 3,217 miles; to Rio de La Plata (entrance lat. 35° 10′ S., long. 56° 26′ W.), 4,209 miles; to Salvador (Baia), Pôrto do, 2,531 miles.

Route 246.—*Reserved as spare.*

(v) ROUTES FROM RIO AMAZONAS

Distances are calculated from a point 10 miles north of Ponta Tijoca, Rio Para entrance.

Route 247. Rio Amazonas to English channel, Lisbon, Gibraltar, or Casablanca

In each case take the reverse of the route described in Chapter II, as summarised below.

(1) To Bishop rock.—Route 43. *Distance*, 3,680 miles.

(2) To Lisbon.—Route 71. *Distance*, 3,170 miles.

(3) To Gibraltar.—Route 85. *Distance*, 3,228 miles.

(4) To Casablanca.—Route 97. *Distance*, 3,057 miles.

Route 248. Rio Amazonas to Madeira, Islas Canarias, or Arquipélago de Cabo Verde

In all cases take the reverse of the route described in Chapter II, as summarised below.

(1) To MADEIRA.—Route 104. *Distance*, 2,646 miles.

(2) To Las Palmas (Islas Canarias).—Route 111. *Distance*, 2,546 miles.

(3) To São Vicente (Arquipélago del Verde).—Route 122. *Distance*, 1,715 miles.

Route 249. Rio Amazonas to Recife

Note.—This passage, if made directly, would be against the strength of the equatorial current, setting W.N.W. along the coast. The greatest strength of the stream, 3 or 4 knots, is found probably at a distance of 100 to 120 miles off this part of the coast, and the inner edge of it between 15 and 45 miles from the shore line. Between the current and the shore, tidal streams prevail, and occasionally a current running to E.S.E., during the prevalence of N.E. winds.

Keep at about 15 to 20 miles from coast, observing the cautions in South America Pilot, Part I, especially concerning the rounding of Cabo San Roque.

Distance from Rio Amazonas to Recife, 1,010 miles.

CAUTION. A strong inset is reported to be usual between Cabo San Roque and Maceio (*Lat. 9° 40′ S., Long. 35° 45′ W.*), which requires guarding against. The current sets to the N.W. as far south as Rio Real, and then the S.W. stream begins.

Route 250. Rio Amazonas to Trinidad, Barbados and Caribbean sea

(1) To TRINIDAD AND BARBADOS.—Follow Rhumb line tracks, passing about 60 miles off Cabo Norte, to lat. 4° 45′ N., long. 51° 05′ W. (about 30 miles north-east of Cabo Orange), and thence continue direct to Trinidad, or Barbados.

(2) To COLON and other CARIBBEAN PORTS:—

(a) Direct route.—From the position 30 mile north-east of Cabo Orange (*See* (1) above), proceed by Rhumb line to lat. 11° 35′ N., long. 60° 35′ W. (about 10 miles north of Tobago), and thence to destination as described in the General Remarks at the beginning of sub-section (iv), on page 69.

(b) Alternative route.—From the position north-east of Cabo Orange proceed by Rhumb line to lat. 13° 28′ N., long. 61° 10′ W. (5 miles north of St. Vincent), and thence to destination as described in Route 92.

Distances from Rio Amazonas are as follows:—

To Barbados (Carlisle Bay), 1,089 miles; to Colon (Panama Canal), 2,241 miles; to Curaçao (S. Anna), 1,573 miles; to Kingston (Jamaica), 2093 miles; to St. Vincent (5 miles north of), 1,162 miles; to Tobago (10 miles north of), 1,066 miles; to Trinidad (Port of Spain), 1,131 miles.

Route 251. Rio Amazonas to Chesapeake bay, or New York

Take the reverse of Routes 229 and 214 respectively with appropriate distances, noting the cautionary notes on currents and fogs between Bermuda and New York.

Distances from Rio Amazonas are:—

To Chesapeake bay entrance by 229 (a), 2,737 miles; by 229 (b), 2,830 miles.

To New York (Ambrose light vessel), by 214 (a), 2,855 miles; by 214 (b), 2,880 miles.

Route 252.—*Reserved as spare.*

(vi) ROUTES FROM PORTS ON EAST COAST OF SOUTH AMERICA

GENERAL REMARKS ON PASSAGES BETWEEN THE VARIOUS PORTS ON THE EAST COAST OF SOUTH AMERICA

(1) Passages between the various ports on the east coast of South America, from Recife (Pernambuco) to Cabo de Hornos (Cape Horn) are really coasting passages and directions for them will be found in South America Pilot, Parts I. and II. (*See* also the appropriate parts of Routes 113, 123, and 267, and Caution regarding Ice at the beginning of sub-section (vii), on page 75.

(2) Generally speaking all routes are as direct as prudent navigation will allow, but off-lying shoals make wide divergences from the coast necessary in many places, notably in the vicinity of Arquipélago dos Abrolhos (*Lat. 18° S.*), Cabo San Tomé (*Lat. 22° S.*), and Albardão lighthouse (*Lat. 33° 12′ S., Long. 52° 42′ W.*).

(3) In making passages the seasonal changes in the coastal curretns should be noted. Information concerning the currents is given in detail in South America Pilot, Part I. Summarising this information in very general terms it may be said that the movement of water is towards Rio de La Plata; southwards from Recife; and northwards from Cabo de Hornos, though the latter set is well away from the coast. Off the coast of Patagonia currents are very variable, and within about 20 miles of the coast tidal influences only are felt.

The important seasonal changes are:

(a) The position, in the vicinity of Recife, at which the southwards going current starts, varies from about lat. 8° S. in December to about lat. 14° S. in June.

(b) The establishment of the "Brazil Inshore counter-current" from May to July. Throughout the whole region of the Brazil (southwards going) current there is always a considerable variation, but during the months of May, June and July, the proportion of northward going sets, near the coast between Cabo Frio (*Lat. 23° S., Long. 42° W.*) and, Rio de La Plata, increase and, in the vicinity of Rio de Janeiro, slightly predominate the southward going sets. Advantage of this may be taken by making northward passages between Rio de La Plata and Cabo Frio closer inshore during these (southern) winter months than at other times of the year. A frequent set on-shore during this period, however, must be guarded against.

The principal distances are:—

From Recife to Bahia Blanca, 2,452 miles; to Salvador (Baia) Pôrto do, 389 miles; to Estrecho de Magallanes (Dungeness), 3,138 miles; to Rio de Janeiro, 1,075 miles; to Rio de La Plata (entrance in lat. 35° 10′ S., long. 56° 26′ W.), 2,067 miles.

From Rio de Janeiro to Bahia Blanca, 1,422 miles; to Salvador (Baia) Pôrto do, 747 miles; to Rio de La Plata, entrance, 1,036 miles; to Estrecho de Magallanes (Dungeness), 2,128 miles.

From Rio de La Plata (entrance) to Bahia Blanca, 444 miles; to Salvador (Baia), Pôrto do, 1,739 miles; to Estrecho de Magallanes (Dungeness), 1,172 miles.

ROUTES

Route 253. Recife to English channel, Gibraltar, or Madeira

In each case follow the reverse of the route described in Chapter II, as summarised below.

(1) To BISHOP ROCK.—Route 45 (1). *Distance*, 3,781 miles.

(2) To GIBRALTAR.—Route 85 (2). *Distance*, 3,131 miles.

(3) To MADEIRA.—Route 105. *Distance*, 2,651 miles.

Route 254. Recife to Islas Canarias, Arquipélago de Cabo Verde and Cape Town

In all cases follow the reverse of the route described in Chapter II, as summarised below.

(1) To LAS PALMAS (Islas Canarias).—Route 113 (1). *Distance*, 2,456 miles.

(2) To SÃO VICENTE (Arquipélago de C. Verde).—Route 123 (1). *Distance*, 1,614 miles.

(3) To CAPE TOWN.—Route 164. *Distance*, 3,318 miles.

Route 255. Recife to South American ports to the southward

See General Remarks and distances at the beginning of this sub-section on page 72.

Route 256. Recife to Rio Amazonas

Proceed as directly as navigation permits, keeping at about 50 miles distance from the shore after rounding Cabo San Roque, in order to get full benefit of the equatorial current.

Distance from Recife to Rio Para entrance (10 miles north of Ponta Tijoca), 1,010 miles.

Route 257. Recife to Trinidad, Barbados, and to Caribbean sea

(1) To Trinidad and Barbados.

Follow Rhumb line tracks passing through lat. 4° 40′ S., long. 34° 35′ W., about midway between Cabo San Roque and Atol das Rocas, and lat 4° 45′ N., long. 51° 05′ W., about 30 miles north-east of Cabo Orange; and thence proceed as directly as navigation permits to destination.

(2) To Ports in Caribbean sea.

(a) via Tobago.—From the position in (1), above, off Cabo Orange proceed by Rhumb line to lat. 11° 35′ N., long. 60° 35′ W., about 10 miles north of Tobago, and proceed thence to destination as described in the General Remarks at the beginning of sub-section (iv) on page 69.

(b) via St. Vincent (West Indies).—From the position in (1), above, off Cabo Orange proceed by Rhumb line to lat. 13° 28′ N., long. 61° 10′ W., 5 miles north of St. Vincent, and thence to destination as described in Route 92.

Note.—During the months of February and March, the westerly current is much reduced in strength between lat. 1° 00′ S., long. 42° 00′ W., and lat. 9° 45′ N., long. 56° 20′ W. From this point, it increases in strength and curves to east or north-east when approaching Barbados; necessitating caution in approaching South Point, Barbados.

Distances from Recife are:—

To Barbados (Carlisle bay), 2,053 miles; to Colon (Panama canal), 3,220 miles; to Curaçao (Santa Anna), 2,552 miles; to Kingston (Jamaica), 3,069 miles; to St. Vincent (5 miles north of), 2,141 miles; to Tobago (10 miles north of), 2,045 miles; to Trinidad (Port of Spain), 2,095 miles.

Note.—The most direct route, rounding Cape San Roque at 15 miles, makes the distances about 45 miles less, but the equatorial current will not be so strong as in the outer route as given above.

General navigational note.—Along the coast of the Main.—Full-powered and most other steam vessels make the direct passage between the various ports on the Main in the West Indies, keeping near the shore where possible when making the passage from west to east, and keeping off-shore, in the prevailing current when proceeding from east to west. Proceeding from Trinidad, westward, the route (taken by the mail steamers) is well southward of the Cumberland bank and other dangers southward of Islas Testigos; thence between Los Frayles and Isla Margarita, and southward of Curaçao and Aruba.

From Trinidad to Demerara, keep as close to the coast as is safe, in order to avoid the current. From Galera point light, steer to a point 30 miles north of Demerara light vessel, and on reaching it, make directly for the light vessel. Keep a good look-out for land. The first mark to be seen, generally, are the wireless masts eastward of the river entrance. These are usually sighted before the lightship is seen.

The currents are strong and very uncertain, and continuous sounding is very necessary; for if a ship should be set to the south-westward, it is possible for her to ground before sighting land.

Caution. Before navigating along this coast, a careful study should be made of the information contained in the Admiralty Sailing Directions and Charts.

Route 258. Recife to Chesapeake bay entrance, New York and Halifax

In each case take the reverse of the route previously described as summarised below.

(1) To Chesapeake bay (entrance).—Route 230. *Distance*, 3,588 miles.

(2) To New York (Ambrose light vessel).—Route 213. *Distance*, 3,670 miles.

(3) To Halifax.—Route 198. *Distance*, 3,540 miles.

Route **259. Rio de Janeiro to ports on East Coast of South America.**—*See* General remarks on passages and distances between the various ports on the East Coast of South America, at the beginning of sub-section (vi), on page 72.

Route 260. Rio de Janeiro to Bishop rock via Las Palmas (Islas Canarias) or via Sao Vicente (Arquipélago de Cabo Verde)

(a) Via Las Palmas.—Follow Rhumb line tracks, as directly as prudent navigation will allow to lat. 20° 00′ S., long. 39° 00′ W., and thence continue by Rhumb line direct to Las Palmas, passing about 65 miles south-east of Ilha de Fernando de Noronha, about 30 miles south-east of St. Paul rocks and about 60 miles south-east of Ilha de Maio, Arquipélago de C. Verde. From Las Palmas follow Route 44 (4) reversed, to Bishop rock.

(b) Via São Vicente.—Follow Rhumb line tracks to São Vicente, taking Route 123 (3), reversed. From São Vicente, proceed by Great Circle to Bishop rock, *i.e.*, by Route 44 (2) reversed.

Distance from Rio de Janeiro to Bishop rock by (a), 4,888 miles; by (b), 4,855 miles.

Distance from Rio de Janeiro to Las Palmas, 3,523 miles; to São Vicente, 2,684 miles.

See Notes and Cautions after Route 178 on page 62.

Route 261.—Rio de Janeiro to Ascension or St. Helena

In each case take the reverse of the route previously described, as summarised below.

(1) To Ascension.—Route 142. *Distance*, 1,899 miles.

(2) To St. Helena.—Route 150. *Distance*, 2,159 miles.

Route 262.—Rio de Janeiro to Cape Town

Follow the Great Circle track direct. *See* notes on approaching Cape Town following Route 48.

Distance from Rio de Janeiro to Cape Town, 3,272 miles.

Route 263. Rio de La Plata to Bishop rock, via Sao Vicente (Arquipélago de Cabo Verde), or Las Palmas (Islas Canarias)

Note.—Routes from Rio de La Plata are measured from the entrance in lat. 35° 10′ S., long. 56° 26′ W.

(a) Via São Vicente.—Follow Rhumb line tracks, passing about 20 miles eastward of Cabo de San Tome and 20 miles eastward of Arquipélago dos Abrolhos (but *see* General Remarks at the beginning of sub-section (vi) on page 72), to a position 3 miles west of Ilha de Fernando de Noronha, and thence continue on the reverse of Route 123 (4) to São Vicente. From São Vicente proceed by Great Circle to Bishop rock (Route 44 (2), reversed.

Note.—The Great Circle from Ilha de Fernando de Noronha to Bishop rock passes through São Vicente and no distance is lost through calling at that place.

(b) Via Las Palmas.—Follow Rhumb line tracks to lat. 20° 00′ S., long. 39° 00′ W., and thence continue to Las Palmas and Bishop rock as described in Route 260 (4).

See also General Remarks at the beginning of sub-section (vi) on page 72.

For notes on the approaches to the English Channel *see* Route 178.

Distances from Rio de La Plata to Bishop rock by (a), 5,843 miles; by (b), 5,880 miles; to Las Palmas, 4,515 miles; to São Vicente, 3,676 miles.

Note.—If calls are to be made at Lisbon (5,214 miles), the most direct route is by Las Palmas; if at Madeira (4,712 miles), the most direct route is by São Vicente.

Route 264. Rio de La Plata to Ascension and St. Helena

Follow the reverse of routes described in Chapter II, as summarised below.

(1) To ASCENSION.—Route 143. *Distance*, 2,830 miles.

(2) To ST. HELENA.—Route 151. *Distance*, 2,942 miles.

Route 265. Rio de La Plata to Cape Town

(a) Direct route.—Follow the Great Circle track, crossing the meridian of 20° 00′ W. in lat. 41° 00′ S. which is the most southerly point of the Great Circle.

Note.—The Great Circle track from Rio de La Plata to round the Cape of Good Hope reaches its most southerly point in lat. 42° 00′ S., long. 20° 00′ W.

(b) Low Powered Steamers.—These vessels should steer on a Rhumb line first to lat 36° 00′ S., long. 40° 00′ W., thence (parallel sailing) along the parallel of 36° 00′ S. to long. 25° 00′ W.; and thence on a Great Circle to Cape Town, passing close southward of the Tristan da Cunha group of islands. The most southerly point of this track is in lat. 37° 40′ S., crossing long. 10° 00′ W.

By this route, ice is usually avoided.

Note.—If rounding the Cape of Good Hope, the Great Circle from lat. 36° 00′ S., long. 25° 00′ W. reaches its most southerly point in approximately lat. 37° 45′ S., long. 7° 00′ W.

Distance from Rio de La Plata to Cape Town by (b), 3,588 miles; by (b), 3,652 miles.

Route 266. Rio de La Plata to Stanley, Falkland islands

Take the direct Rhumb line track. The Falkland current, setting north and N.N.E., will be experienced, almost directly contrary to the course.

Distance from Rio de La Plata to Stanley, 998 miles.

CAUTION.—Ice may be encountered on this route. *See* remarks at the beginning of sub-section (vii), on page 75.

Ronte 267. Rio de La Plata to Bahia Blanca or Estrecho de Magallanes

(1) To BAHIA BLANCA.—Proceed as directly as navigation permits.

(2) To CABO VIRGENES (Cape Virgins).—Take the direct Rhumb line, after clearing the southern line of the Rio de La Plata entrance.

Note.—Low Powered Steamers, bound either to Bahia Blanca, or to Cabo Virgenes (Cape Virgins), should take an inshore route in order to keep out of the Falkland current, setting northward, sometimes at a speed of two knots, at a distance of 50 miles from the land. Southward of Cabo Corrientes only tidal streams are felt within a distance of 20 miles from the land, and better weather will be experienced close in to the shore than in the offing, with westerly winds.

CAUTION. Special caution is required in approaching Estrecho de Magallanes (Magellan strait), as the rise and fall of the tide is great, and the streams at the entrance run with great strength, causing, at times, an indraught towards the shoal and dangers extending from Cabo Virgenes.

Distance from Rio de La Plata to Bahia Blanca, 444 miles; to Cabo Virgenes, by (2), 1,160 miles; by Low powered route, 1,235 miles.

Route 268. Rio de La Plata to Rio de Janeiro or Recife

Proceed direct in both cases.

Notes.—From September to February a southerly set of current (Brazil current) will be experienced. It runs at a speed of 40 miles a day near the shore, but is less strong at a distance of 30 miles to 40 miles eastward of Cabo de San Tome.

During other times of the year advantage will be gained by keeping as close to the shore as navigation permits (but not less than 20 miles eastward of Arquipélago dos Abrolhos). Between March and August, the inshore currents are either weak and variable, or setting to the northward.

Between Cabo Frio and Pôrto do Salvador (Baia) the northerly set is more certain, and in June occasionally is as much as 40 miles a day; but in July and August it turns to the south-westward.

Between Pôrto do Salvador (Baia) and Recife the current is permanently to the northward, near the shore, from May to August.

Distance from Rio de La Plata to Rio de Janeiro, 1,036 miles; to Recife, 2,067 miles.

See also General Remarks at the beginning of sub-section (vi) on page 72.

Route 269. Rio de La Plata to Caribbean sea, Gulf of Mexico, Chesapeake bay, New York or Halifax

Follow Rhumb line tracks up the coast of South America (*see* General Remarks at the beginning of sub-section (vii) on page 75) to lat. 4° 40′ S., long. 34° 35′ W., about midway between Cabo San Roque and Atol das Rocas, and thence:

(1) To CARIBBEAN SEA or GULF OF MEXICO.—Continue on Rhumb line track to lat. 4° 45′ N., long. 51° 05′ W., about 30 miles north-east of Cabo Orange, and thence by one of the following routes:—

(a) Via Trinidad.—Follow a Rhumb line track to lat. 10° 55′ N., long. 60° 55′ W., about 5 miles north of Galera point, Trinidad, and thence to Curaçao.

(b) Via Tobago.—Follow Rhumb line track to lat. 11° 35′ N., long. 60° 35′ W., about 10 miles north of Tobago, and thence proceed to destination as described in the General Remarks at the beginning of sub-section (iv), on page 69.

(c) Via St. Vincent.—Follow a Rhumb line track to lat. 13° 28′ N., long. 61° 10′ W., 5 miles north of St. Vincent, West Indies, and thence proceed to destinations as described in Route 92.

(2) To CHESAPEAKE BAY, NEW YORK or HALIFAX.—From the position about mid-way between Cabo San Roque and Atol das Rocas, in lat. 4° 40′ S., long. 34° 35′ W., take the Great Circle track direct to either destination.

Distance from Rio de La Plata by (1) to Colon by (b), 5,285 miles; to Curaçao by (a), 4,596 miles; by (b), 4,617 miles; to St. Vincent by (c), 4,206 miles; to Tobago by (b), 4,110 miles; to Trinidad by (a) (Galera point, 4,105 miles, Port of Spain, 4,165 miles).

Distance from Rio de La Plata by (2) to Chesapeake bay (entrance), 5,655 miles; to New York (Ambrose light vessel), 5,735 miles; to Halifax, 5,605 miles.

Route 270.—*Reserved as spare.*

(vii) ROUTES FROM FALKLAND ISLANDS, ESTRECHO DE MAGALLANES (MAGELLAN STRAIT), AND CABO DE HORNOS (CAPE HORN)

Ice.—Caution.—For most of the year the mean limit of icebergs lies well to the south-east of the Falkland islands, but during the months of November and December the mean limit runs through the Falkland islands, from about 100 miles south-east of Cabo de Hornos to about lat. 43° 00′ S., long. 52° 00′ W., before turning eastwards to pass about 500 miles south of the Cape of Good Hope. Icebergs north and west of this mean limit are, however, frequently found at all times of the year, and the risk of meeting icebergs when on passage to or from the Falkland islands, Estrecho de Magallanes, and Cabo de Hornos must be considered ever present. *(See* Antarctic Pilot and South America Pilot, Parts I. and II.; also Chart 1,241, Ice Chart of Southern Hemisphere).

Route 271. Stanley (Falkland islands) to Ascension

Follow Route 144 in reverse. *Distance*, 3,403 miles.

Route 272. Stanley (Falkland islands) to Cape Town

See the Caution concerning ice at the beginning of this sub-section on this page.

(a) Usual route.—Follow Rhumb line tracks through lat. 43° 00′ S., long. 47° 00′ W., to lat. 40° 20′ S., long. 33° 00′ W.; and thence continue by Great Circle either to Cape Town, passing close south of Gough Island, or to about 50 miles south of Cape of Good Hope if bound to the Indian ocean.

(b) Low-powered ships.—To lessen the risk of meeting ice, and to obtain better weather, these vessels should proceed by Rhumb line tracks first to lat. 36° 00′ S., long. 40° 00′ W., and thence to lat. 36° 00′ S., long. 25° 00′ W.; thence continue by Great Circle to Cape Town, passing close south of Nightingale Island (Tristan da Cunha Group).

Distance from Stanley to Cape Town by (a), 3,800 miles; by (b), 4,060 miles.

Note.—The direct Great Circle track reduces the distance to 3,333 miles, but reaches a south latitude of 53° and so cannot be recommended on account of ice and bad weather.

Route 273. Stanley (Falkland islands) to Estrecho de Magallanes

Proceed by Rhumb line tracks as directly as navigation will allow, passing either southward or northward of the Falkland islands.

Distance from Stanley, passing southward of Falkland islands, 425 miles; passing northward of Falkland islands, 444 miles.

Route 274. Stanley (Falkland islands) to Rio de La Plata

Follow Route 266 in reverse *(see* page 74). *Distance*, 998 miles.

Route 275. Stanley (Falkland islands) to Rio de Janeiro and Recife

In each case follow Rhumb line tracks as directly as navigation will allow. *See* General remarks at the beginning of sub-section (vi) on page 72.

For routes onwards to Caribbean, Gulf of Mexico, and North American ports join Routes 253 to 258 from Recife.

Distance from Stanley to Rio de Janeiro, 1,860 miles; to Recife, 2,856 miles.

Route 276. Estrecho de Magallanes (Magellan strait) to Cape Town.—*See* Caution regarding ice at the beginning of this sub-section on this page.

(a) Usual route.—Follow Rhumb line tracks from Dungeness, passing through the following positions: lat. 47° 50′ S., long. 60° 00′ W.; lat. 43° 50′ S., long. 50° 00′ W.; lat. 41° 10′ S., long. 40° 00′ W.; to lat. 40° 20′ S., long. 33° 00′ W., and thence continue by Great Circle to Cape Town, passing close south of Gough Island.

(b) Low-powered ships.—These vessels should follow Rhumb line tracks to lat. 36° 00′ S., long. 40° 00′ W., to lat. 36° 00′ S., long. 25° 00′ W., and thence continue by Great Circle to Cape Town, passing close south of Nightingale island.

Distance from Estrecho de Magallanes (Dungeness) to Cape Town, by (a), 4,166 miles; by (b), 4,407 miles.

Route 277. Estrecho de Magallanes to Rio de La Plata

(a) Usual route.—Follow the Rhumb line track direct on the reverse of Route 267.

(b) Low-powered ships.—These vessels should follow Rhumb line tracks passing all the main headlands at a distance of between 20 and 50 miles; thus obtaining the full benefit of the Falkland current *(see* South American Pilot, Part I.) and usually enjoying better weather.

Distance from Estrecho de Magallanes (Dungeness) to Rio de La Plata, by (a), 1,172 miles; by (b), 1,210 miles.

Route 278. Estrecho de Magallanes to ports on the East Coast of South America (north of Rio de La Plata), and to ports on both sides of the Atlantic by way of Cabo de S. Roque or Pôrto de Recife.—*See* General remarks and routes in Chapter III, sub-section (vi), on page 72, and Routes 253, 254, 256, 257, and 258 from Recife.

Route 279. Cabo de Hornos (Cape Horn) to Rio de La Plata.—*See* South American Pilot, Parts I. and II.

Pass by Rhumb line tracks through Estrecho de la Maire, and thence proceed as in Route 277 (a) or 277 (b) above.

Distance from Cabo de Hornos to Rio de La Plata, 1,347 miles.

Route 280. Cabo de Hornos to Recife and to ports in the North Atlantic

Follow Rhumb line tracks through Estrecho de la Maire, and thence to a position about 20 miles eastward of Cabo de S. Tome; thence pick up and follow the routes from Rio de Janeiro to Recife and to all destinations. *See* Routes 257, 258, 259, and 260.

Route 281. Cabo de Hornos to Stanley (Falkland islands)

Proceed by Rhumb line tracks as directly as navigation will allow either through Estrecho de la Maire, or south of Isla de los Estados (Staten I.).

The distance via the former is 446 miles, or by the latter, 439 miles.

See the remarks regarding ice at the beginning of this sub-section on this page.

Route 282. Cabo de Hornos to Cape Town

Follow Route 281 above to the vicinity of Stanley (Falkland islands), and then pick up and follow Route 272 (a) or (b), Stanley (Falkland islands) to Cape Town.

Distance from Cabo de Hornos to Cape Town by Route 272 (a), 4,237 miles; by Route 272 (b), 4,504 miles.

For Routes to, or from Cabo de Hornos in the Pacific ocean.—*See* Section B, Part IV.

Route 283.—*Reserved as spare.*

Route 284.—*Reserved as spare.*

PART II

MEDITERRANEAN AND BLACK SEAS

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SECTION B. PART II

Chapter I

MEDITERRANEAN—WINDS AND WEATHER—CURRENTS

WINDS AND WEATHER

GENERAL REMARKS

The following description of the winds and weather of the Mediterranean amplifies the general statement given in Section A. For more precise information regarding oceanic winds and weather the mariner is referred to the atlas of Monthly Meteorological Charts of the Atlantic ocean (M.O.M. 402 and 402a)—in which is included the Mediterranean sea—published by the Marine Branch of the Meteorological Office, Air Ministry. Detailed information relating to specific localities should be sought in the appropriate volumes of the Admiralty Sailing Directions.

In reading the following description reference should be made to the World Climatic Charts 5301 and 5302, which will be found in tbe pocket at the end of this book.

The weather of the Mediterranean is markedly seasonal, being characterised by hot dry summers with mainly light or moderate winds, and mild rainy winters with a rather high frequency of strong winds and gales. The situation of this sea, surrounded by land, much of which is of either a mountainous or of a desert nature, and also the indented nature of parts of the coast, lead to the occurrence of a large number of local winds, many with special names and special characteristics. No attempt will be made here to describe these local winds, for information concerning which reference should be made to the appropriate volumes of the Admiralty Sailing Directions.

Over the greater part of the open waters of the Mediterranean winds from between north and west are the most frequent, though the passage of depressions or " lows " across the area causes great variations in both the direction and force of the wind. From about November to March these lows are frequent and often vigorous, while from about May to September they are less common and much less intense.

For convenience in describing the winds and weather of the Mediterranean the area has been divided into two parts as follows:—

1. The Western Mediterranean comprising the area west of the Sicilian channel.
2. The Eastern Mediterranean comprising the area east of the above line.

It is emphasized that the statements which follow apply to the open sea away from the influence of the land, in the vicinity of which marked differences are likely to be found.

1. THE WESTERN MEDITERRANEAN

(a) November to March

In the more confined part of the area—west of about longtitude 1° W, winds mostly run parallel to the coast, westerlies being somewhat more common than easterlies from January to March, and very considerably more frequent in November and December.

Over the remainder of the area as far east as the longitude of Sardinia the most frequent wind directions are from between north and west, with a bias towards the latter direction in the south.

In the northern part of the Tyrrhenian sea there is no clearly predominating wind direction, though winds from some northerly point are more common than those from a southerly point. In the southern part of this sea and in the Sicilian channel the prevailing direction is north-westerly.

In January, which in most parts of the Western Mediterranean is the stormiest month, winds reach Beaufort force 7 or above on 6–9 days per month in the north-west and 3–7 days per month over the remainder of the area in the average year. The majority of winter gales are from between north and west, though north-easterly gales also are not uncommon, and gales from other directions may occasionally be experienced.

Weather at this season is subject to rapid changes due to the passage of lows with their associated fronts and belts of cloud and rain; the rain is generally heavier but of shorter duration than in the British Isles.

Visibility in the open sea is generally good except when reduced by rain, but it may at times be only moderate with winds from a southerly quarter.

(b) May to September

In that part of the area south of about latitude 40° N. and west of the longitude of Sardinia, winds are most frequently from between east and north-east, or from between west and south-west, those from between the former directions being somewhat the more common, though the preponderance is not great.

In the remainder of the area from June to August the most frequent wind directions are from between north and west; in May and September there is no clearly predominant wind direction.

Winds are likely to reach Beaufort force 7 or above on 1 or 3 days per month in the north-west of the area; elsewhere winds of this strength are rare at this season.

Weather in July and August is generally fine with little or no rainfall—especially in the south and east. Cloud amounts are larger and rain somewhat more common in May and September, especially in the latter month and north-east of a line joining the Gulf of Lions—Sardinia—Sicily.

Visibility is generally good, though occasional patches of sea fog may be experienced in early summer, and with winds from a southerly quarter haze is sometimes prevalent.

(c) April and October.—*See* (2) (c) Page 78.

2. EASTERN MEDITERRANEAN

(a) November to March

South of about latitude 35° N. winds are most often from between southwest and north, while north of the above parallel between Sicily and Greece there is no clearly prevailing wind direction.

In the greater part of the Adriatic winds from between north and east are most frequent, though these are often interrupted by winds from a southerly quarter blowing in advance of an approaching depression. The confined nature of this sea gives rise to many local effects, details of which will be found in the Admiralty Sailing Directions.

In the Ægean wind directions are similar to those described above for the Adriatic, but with an increased frequency of southerly winds in the south of the area.

At the height of the season winds are likely to reach force 7 or above on 6–9 days per month in the Ægean and eastern part of the Ionian seas, and 3–6 days per month elsewhere in the area.

Weather at this season—as in the Western Mediterranean is subject to rapid changes due to travelling depressions, and the statements made above for that area apply equally to the Eastern Mediterranean.

Visibility is generally good except when reduced by rain, but with winds from a southerly quarter, which are experienced in advance of an approaching depression it is often only moderate.

(b) May to September

Over the whole of the Eastern Mediterranean, other than the Ægean, the prevailing winds are northwesterly throughout the period; these north-westerlies are particularly persistent in July and August and east of the twentieth meridian, in which area winds from directions other than between north and west are uncommon.

In the Ægean the prevailing wind is northerly; here also, the degree of persistence is particularly high in July and August, during which months the great majority of winds are from between north-east and north-west.

From May to August winds are likely to reach force 7 only on rare occasions, except in the Ægean in July and August where winds of this strength may be expected on 1 or 2 days per month. In September the frequency of these winds is 1–3 days per month over most of the Eastern Mediterranean.

Over the greater part of the open waters of the area, weather at this season is fine with small amounts of cloud and little or no rain—especially in the south and east of the area and in July and August. In the northern parts of the Ægean and Adriatic, however, some rain is likely in all months of the period.

Visibility is generally good, though occasional patches of sea fog may be experienced in early summer—most often in the northern part of the area; with winds from a southerly quarter haze is sometimes prevalent.

(c) April and October

In the transitional months of April and October conditions can be taken as intermediate between winter and summer conditions, though it must be realized that considerable variations are likely as between different years.

CURRENTS

Mediterranean

The currents of the Mediterranean are associated with those of the Atlantic ocean. Part of the water from the Portugal current (*see* Section B) enters the Strait of Gibraltar and flows along the north coast of Africa. Passing Cape Bon it continues in a general south-easterly direction to the region of Port Said. Turning northward at the eastern end of the Mediterranean, the counter-clockwise circulation is completed by a more variable return current along the northern coasts of the Mediterranean. In following the coast, this forms counter-clockwise loops in seas such as the Ægean and the Adriatic. The out-flow from the Mediterranean is a sub-surface one, westward through the Strait of Gibraltar beneath the inflowing surface current.

Black Sea

The general circulation is counter-clockwise. There is an almost constant surface flow of water from the Black sea to the Ægean sea through Karadeniz or İstanbul boğazi (the Bosporus), Marmara denizi (Sea of Marmara), and Çanakkale boğazi (the Dardanelles). There is a sub-surface return current below this, from the Ægean sea to the Black sea.

SECTION B. PART II

Chapter II

ROUTES

Note.—For the purposes of this book, the Mediterranean has been considered mainly as a link between the Atlantic and Indian oceans; therefore only routes between the terminal ports, Gibraltar and Port Said, and between these two and certain selected ports in the Mediterranean itself, are given in this chapter. For routes other than the above the various charts and volumes of the Mediterranean and Black sea Pilots are a sufficient guide.

CAUTION. Attention is drawn to the remarks on Tunny Fisheries to be found in the Mediterranean Pilot, Volumes I. to II., and to the marks used to denote the presence of the nets. Apart from the damage that may be done to the nets, a vessel passing through them may become unmanageable, due to a fouled propellor. *See* also under Route 46 (3) on page 49.

(i) FROM GIBRALTAR

For routes to and from the Atlantic ocean from and to Gibraltar see Section B, Part I.

Route 285. Gibraltar to Malta, Port Said and the Levant

After leaving Gibraltar, steer to pass 10 miles northward of Isla de Alboran, and thence for Cape Caxine, off Alger, passing it, and other points of the African coast at between 10 and 20 miles distance. There is often a southerly set felt along the Algerian coast, but the main current of this part of the Mediterranean is to the eastward, along the whole of the African coast.

From a position 10 miles northward of Cape Bougaroni, make for the Galita channel, and pass about 5 miles northward of Cape Serrat, the Fratelli rocks, Ras Engela, the Cani rocks, and Cap Bon. From this last position steer to pass about 5 miles northward of Isola di Pantelleria and make for a position about 5 miles northward of Gozo. From Gozo proceed as direct as prudent navigation permits to all destinations.

Approaching Port Said, a vessel is recommended to make a point 10 miles northward of Damietta lighthouse; soundings should be obtained if the weather is at all thick, as the easterly current is uncertain in strength, its rate being sometimes as much as 2 knots after westerly winds.

Note.—For routes onward from Port Said, through the Suez canal, to the Indian ocean, *see* Section B, Part III, Chapter II.

Distances from Gibraltar:—

To Alexandria, 1,798 miles; to Alger, 412 miles; to Beirut, 2,004 miles; to Cyprus (Famagusta), 1,854 miles; to Haifa, 2,000 miles; to İskanderún (Alexandretta), 2,022 miles; to Malta, 984 miles; to Port Said, 1,913 miles.

Route 286. Gibraltar to Gulf of Lions, Genova, or Livorno

Keep well clear of the Spanish coast until abreast of Cabo de Gata, so as to profit by the easterly current entering the Mediterranean, and then keep at about 20 miles from the coast of Spain as far as Cabo de San Antonio. From thence proceed as direct as safe navigation permits to destination.

Distance from Gibraltar to Barcelona, 515 miles; to Genova (Genoa), 847 miles; to Livorno (Leghorn), 863 miles; to Marseille, 690 miles.

Route 287. Gibraltar to Sardinia, Napoli, or Sicily

Keep well clear of the Spanish coast until abreast of Cabo de Gata, so as to profit by the easterly current, and, if bound to Napoli or Sardinia, steer direct for the south end of that island; if proceeding to Sicily, make for the north side of that island, giving Keith reef a wide berth.

Distance from Gibraltar to Sagliari (Sardinia), 724 miles; to Napoli (Naples), 979 miles; to Messina, 1,023 miles; to Palermo, 914 miles.

Route 288. Gibraltar to the Adriatic and Ægean seas

Follow Route 285 until abreast Gozo light, whence the courses onward are as direct as navigation permits to all destinations.

Distances from Gibraltar are:—To Athens (Piræus) 1,481 miles; to İstanbul (Constantinople), 1,800 miles; to İzmir (Smyrna), 1,641 miles; to Trieste, 1,648 miles; to Thessaloniki, 1,691 miles.

For continuation into the Black sea, *see* Route 300.

Route 289.—*Reserved as spare.*

(ii) FROM PORT SAID

For routes from the Indian Ocean to Port Said, *see* Section B, Part III.

Route 290. Port Said to Malta and Gibraltar

Follow the reverse of Route 285 except that, after passing Malta, steer to pass northward of Galita bank, thence making direct for Cabo de Gata in order to avoid the east-going current along the African coast. From Cabo de Gata follow a track as close to the Spanish coast as safe navigation permits, so as to avoid the adverse current entering the Mediterranean sea from the Atlantic ocean. Occasionally a westerly set will be found along this shore.

Distance from Port Said to Gibraltar, 1,913 miles; to Malta, 937 miles.

Note.—For routes onward from Gibraltar to ports on the coast of the Atlantic ocean, *see* Section B, Part I.

Route 291. Port Said to Levant, Ægean sea, or the Adriatic

Follow courses as direct as navigation permits to all destinations.

Distances from Port Said are:—

To Athens (Piræus), 593 miles; to Beirut, 228 miles; to Brindisi, 928 miles; to Cyprus (Famagusta), 255 miles; to Haifa, 169 miles; to İskanderun (Alexandretta), 376 miles; to İstanbul, 786 miles; to İzmir (Smyrna), 598 miles; to Kotor, 1,020 miles to Thessaloníki, 736 miles; to Trieste, 1,294 miles.

Note.—For routes onward from İstanbul to the Black sea, *see* Route 300.

Route 292. Port Said to Western Mediterranean Ports

To Gibraltar and Malta *see* Route 290.

See Section D. Part I. Index on pages 340 and 341.

When bound to Napoli, Livorno, or Genova, steer to pass through Stretto di Messina.

When bound to Marseille proceed either through Stretto di Messina and Bonifacio strait, or pass south of Sicily and Sardinia, the latter being some 50 miles longer. Bound for Barcelona take the latter route. When bound to Western Mediterranean ports southward of those mentioned above, follow Route 290 as far as Galita bank, and thence proceed to destination; the African coast should be given a wide berth as long as possible.

Distances from Port Said:—

To Alger, 1,503 miles; to Barcelona, 1,588 miles; to Cagliari (Sardinia), 1,245 miles; to Genova, 1,419 miles; to Livorno (Leghorn), 1,346 miles; to Marseille, 1,512 miles; to Messina, 933 miles; to Napoli, 1,108 miles; to Valencia, 1,669 miles.

Route 293.—*Reserved as spare.*

(iii) TO GIBRALTAR

For routes onward to ports on the coasts of the Atlantic ocean, *see* Section B, Part I.

Route 294. Western Mediterranean ports to Gibraltar

From Malta *see* Route 290.

From Marseille proceed as direct as safe navigation permits to make the Spanish coast at Cabo de San Antonio, thence to Cabo de Gata, from which point it is advisable to keep close along the Spanish coast to Gibraltar in order to avoid the adverse east-going current. Occasionally a westerly set will be felt along this shore.

From Genova or Livorno, if passing north of Islas Baleares, make the Spanish coast at Cabo de Palas; if passing south of these islands, at Cabo de Gata. In either case proceed to Gibraltar as above.

From Sardinia, Sicily, or Napoli, take the reverse of Route 287, except that, after making Cabo de Gata, proceed to Gibraltar as above.

Distances as in Routes 286 and 287.

Route 295. Adriatic, Ægean, and Eastern Mediterranean ports to Gibraltar

From the Adriatic or from the Ægean via the Corinth canal, the shorter route is through the Stretto di Messina and to the north of Sicily. After leaving Sicily, steer direct for Cabo de Gata to avoid the east-going current, and then proceed to Gibraltar as for Route 292.

Coming from the Ægean round the south of Greece, or from the Levant, steer for south of Sicily to join Route 290 to Gibraltar.

Distances as in Routes 285 and 288.

Route 296.—*Reserved as spare.*

(iv) TO PORT SAID

For routes to and from the Indian ocean, via Suez, *see* Section B, Part III.

Route 297. Western Mediterranean ports to Port Said

From Gibraltar or Malta *see* Route 285.

From other Western Mediterranean ports the route is the reverse of Route 292, except that from Algerian and North Tunisian ports Route 285 should be followed.

Distances as in Routes 285 and 292.

Route 298. Levant, Adriatic and Ægean to Port Said

Follow the reverse of Route 291. *Distance* as in that route.

Route 299.—*Reserved as spare.*

(v) BLACK SEA

Route 300

All routes are as direct as navigation permits. Vessels leaving the Black sea for Gibraltar or Port Said should refer to Routes 295 and 298 respectively.

Distances from İstanbul (Constantinople):—

To Batumi, 586 miles; to Constanța, 196 miles; to Kyerch,' 441 miles; to Mariupol,' 560 miles; to Novorossiisk, 456 miles; to Odyessa, 342 miles; to Sulina, 254 miles; to Syevastopol,' 299 miles; to Taganrog, 611 miles; to Gibraltar, 1,800 miles; to Port Said, 786 miles.

See Section D. Part I. Index on pages 340 and 341.

PART III
RED SEA, INDIAN OCEAN & PERSIAN GULF

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WINDS AND WEATHER

The following description of the winds and weather of the Indian ocean amplifies the general statement given in Section A. For more precise information regarding oceanic winds and weather the mariner is referred to the atlas of Monthly Meteorological Charts of the Indian ocean (M.O.M. 470) published by the Marine Branch of the Meteorological Office, Air Ministry. Detailed information relating to specific localities should be sought in the appropriate volumes of the Admiralty Sailing Directions.

In reading the following description reference should be made to the World Climatic Charts 5301 and 5302, which will be found in the pocket at the end of this book.

NORTH INDIAN OCEAN

The winds and weather of the whole of the North Indian Ocean are dominated by the alternation of the monsoons. As was stated in Section A, the monsoons are seasonal winds caused by the alternate heating and cooling of large land masses—in this case the vast land mass of Asia. These seasonal changes of temperature give rise to changes of pressure, which in turn cause modifications in the oceanic winds in the vicinity.

The South-West Monsoon *(June to September).*

In the northern summer the intense heating of the Asiatic land mass results in the establishment of a large area of low pressure centred approximately over North-west India. The equatorial trough of low pressure, in which is situated the Doldrums, is distorted towards the north, and at the height of the season lies over Northern India; during this season therefore, the doldrums no longer exist over the Indian ocean. The South-East Trade Wind of the South Indian ocean is drawn across the equator, is deflected to the right by the effect of the earth's rotation, and joins in the cyclonic circulation of wind around the area of low pressure mentioned above. The resulting south-westerly wind felt in the North Indian ocean, Arabian sea, and Bay of Bengal is known as the South-West Monsoon. The general distribution of pressure and wind at this season is shown on Climatic Chart 5302, from which it will be noted that in the eastern part of the Arabian sea the prevailing wind direction is more nearly west than south-west.

The strength of the wind varies considerably in different parts of the ocean. It is strongest in the western part of the Arabian sea where, over a considerable area, the wind averages Beaufort force 6 at the height of the season, and reaches force 7 or above on over 10 days per month *(see* Climatic Chart 5302); the worst area is some 250 miles east of the island of Socotra, where in July about 50% of ships' observations record winds of force 7 or above.

In the extreme northern, and in the eastern parts of the Arabian sea in July and August, the monsoon averages about Beaufort force 4, though it often freshens to force 5 or 6, and attains force 7 or over on 3–6 days per month north of about latitude 10° N.

In the Bay of Bengal the monsoon blows fresh, its average strength being Beaufort force 4–5; over the greater part of the Bay the wind reaches Beaufort force 7 or above on 5-10 days per month in July and August.

Between the equator and about latitude 5° N. and east of the 60th meridian, winds are generally lighter, and only average about Beaufort force 3; they are also considerably more variable in direction, though generally from between south and west.

In the Malacca straits winds are mostly light, and are subject to considerable variation in direction and strength due to land and sea breezes *(see* Section A) and other local effects. In the north, winds are most often south-westerly, while in the south the most frequent direction is south-east. Although the monsoon is generally light, there are often periods of stronger winds accompanied by squalls during which winds may sometimes reach gale force. The best known of these squalls are the "*Sumatras*," which blow from some westerly point, and occur most frequently at night; they are described in detail in the Admiralty Sailing Directions.

Weather over most of the North Indian ocean at this season is cloudy and unsettled with considerable rainfall—especially off the west coasts of India and Burma, where it is very heavy. In the western part of the Arabian sea however, cloud amount and rainfall decrease towards the north and west and both are generally small in the vicinity of the African and Arabian coasts. Rainfall is also small at this time in the immediate vicinity of the east coasts of Ceylon and India as far north as about latitude 15° N.

Visibility is good in most parts of the area except when reduced by rain, and in the northern and western parts of the Arabian sea where it is often only moderate, and sometimes poor, within 200 miles or so of the coast; in this latter zone in July and August visibility is likely to be less than 5 miles on about 50% of occasions.

The North-East Monsoon *(December to March).*

In the northern winter the great Asiatic land mass becomes greatly chilled, as a result of which an intense area of high pressure (or anticyclone) becomes established over Mongolia and eastern Siberia. The Doldrum belt is situated in the southern hemisphere at this season, and an anticyclonic wind circulation is set up around the above "high." The resulting north-easterly wind which is experienced in the North Indian ocean, Arabian sea and Bay of Bengal is known as the North-East Monsoon. The general distribution of pressure and wind at this season is shown on Climatic Chart 5301, from which it will be observed that in the eastern part of the Arabian sea, and also towards the equator, the prevailing wind direction is more nearly north than north-east.

There are two areas in which the monsoon is subject to considerable interruption, or in which the wind is rather variable in direction. The first is in the Arabian sea north of about latitude 20° N., where the variations in the direction and strength of the wind are caused by the passage of depressions across Persia or along the Makran coast, and the second is between the equator and about latitude 5° N. and east of about longitude 90° E., in which area winds, although mostly from some northerly point, are generally light and somewhat variable in direction.

Over the greater part of the North Indian ocean the strength of the monsoon averages Beaufort force 3-4 at the height of the season, though towards the equator it decreases to force 2–3, except west of about longitude 55° E.; it is also only light in the Malacca strait. Winds are likely to reach force 7 only on rare occasions.

Weather in the Arabian sea and Bay of Bengal is generally fine with small amounts of cloud and little or no rain. Cloudiness and rainfall increase towards the south and east, especially in December and January when considerable rain occurs in the southern part of the Bay of Bengal south of a line joining northern Ceylon and Sumatra.

Visibility in the open ocean away from the effects of the land is almost always good or very good at this season, and fog is unknown. In the northern and eastern parts of the Arabian sea, however, visibility is often reduced by dust haze—especially in the latter part of the season, while in the northern part of the Bay of Bengal it may be reduced by smoke haze and land mists carried seaward by the prevailing northerly winds.

The Inter-monsoon Seasons *(April, May and October, November).*

These periods are characterised by the northward and southward migration across the area of the Doldrum belt, and by the progressive replacement of the North-East Monsoon by the South-West Monsoon in April and May, and of the South-West Monsoon by the North-East Monsoon in October and November; the South-West Monsoon therefore becomes established in the south earlier than in the north and vice-versa. The width of the Doldrum belt, however, varies greatly from day to day and its movements are irregular; consequently the whole area can be regarded primarily as one of light winds (apart from squalls and tropical storms) with a rather high frequency of calms, and with the oncoming monsoon becoming gradually established.

Except in squalls (which are common) or in association with tropical storms *(see* below), winds in the open ocean are lightly to reach Beaufort force 7 or above only on rare occasions, except in the western part of the Arabian sea between latitude 5° N. and 10° N. and west of longitude 55° E., where in May south-westerly winds of this strength may be expected on about 2 days. In the Malacca strait "Sumatras" *(see* above) occur occasionally.

Weather varies considerably, fair or fine conditions alternating with those typical of the Doldrums, *i.e.,* cloudy, squally weather with frequent heavy showers and thunderstorms; these conditions spread northward during April and May and retreat southward during October and November. In the northern part of the Arabian sea however, fine weather predominates throughout these inter-monsoon months.

Visibility over the open ocean is always good except when reduced by heavy rain. Near the coast in the northern and eastern parts of the Arabian sea however, it is sometimes reduced by dust haze in April and May.

Tropical Storms (Cyclones)

These dangerous storms, which have been described in Section A, affect the Arabian sea and Bay of Bengal.

In the Arabian sea the vast majority of cyclones occur at or near the change of the monsoon, *i.e.,* from April to June and in October and November, the periods of greatest frequently being from early May to mid-June, and from mid-October to mid-November. Although they have been recorded they are extremely rare in July, September and December, and are unknown in August and from January to March.

In the Bay of Bengal the great majority of storms occur from May to November with November as the month of greatest frequency. They occur very occasionally in March, April and December, are practically unknown in January and entirely so in February.

More detailed information regarding storm frequencies in specific localities will be found in the Admiralty Sailing Directions. Precursory signs of the proximity of these storms and the action recommended to ships in order to avoid them is given in Section A.

THE RED SEA AND GULF OF ADEN

The prevailing winds in the Red sea blow parallel to the coast. The seasonal change in the pressure distribution over adjacent land masses causes a seasonal reversal of the prevailing winds in the southern part of the area.

In the northern winter an extension of the Asiatic anticyclone is centred over the interior of Arabia, while another area of high pressure lies over the Sahara. The northern part of the Red sea is under the influence of the Saharan " high," resulting in the prevalence here of north-north-westerly winds, while in that part of the area south of about latitude 18° N. from October to April, winds are influenced mainly by the Arabian high with the result that the prevailing wind direction here is south-south-east. Between the north-north-westerlies of the north and the south-south-easterlies of the south lies an area of light variable winds and calms.

During the northern summer pressure decreases eastward and northward towards the centre of low pressure over North-west India *(see under South-West Monsoon above)*, resulting in a gradient for north-north-westerly winds over the whole of the Red sea; these north-north-westerlies, therefore, prevail over the southern as well as the northern part of the area from late May to late September. South of latitude 18° N., May is characterised by the progressive retreat of the south-south-easterlies, and corresponding advance of the north-north-westerlies, while the process is reversed in late September and early October.

Winds in the Gulf of Aden form part of the monsoon circulation of Asia; the predominant winds are east-north-easterly from October to April, but become south-easterly in the Strait of Bāb-al-Mandab. In May wind direction is variable while from June to September south-westerly winds prevail.

In the Red sea north of latitude 18° N., the average strength of the wind is Beaufort force 4 throughout the year. Gales are most frequently, though not invariably, from North-West or North; in the Gulf of Suez, gales are most common in December and August during which months winds reach force 7 or above on about 2 days per month; over the remainder of the area, February is the month of greatest frequency with 1–2 days with winds of this force. Except in the Gulf of Suez, gales are exceedingly rare during the South-West Monsoon season.

Southward of latitude 18° N. the south-south-easterly winds which prevail from October to April average Beaufort force 4–5, rising to nearly force 6 near the Strait of Bāb-al-Mandab in February; the north-north-westerlies which prevail from June to September average force 3–4. Gales are most common near the Strait of Bāb-al-Mandab in December and January, during which period winds in this area may be expected to reach force 7 or above on 3–4 days per month. As in the northern part of the Red sea, gales are rare during the season of the South-West Monsoon.

In the Gulf of Aden the east-north-easterlies average force 2–3 from December to March, and gales are rare. From June to September within the main part of the gulf, the strength of the South-West Monsoon averages about Beaufort force 4, and winds reach force 7 or above on 1–2 days per month. The average strength of the wind and the frequency of gales however, increases rapidly towards the eastern end of the gulf, and eastward of C. Guardafui winds are likely to reach force 7 or above on 10–15 days in July. Tropical cyclones (*see* above on this page) are very rare in the gulf, only 3 or possibly 4 having been experienced in the last 50 years.

Weather over the whole of the Red sea and Gulf of Aden is generally fine with small amounts of cloud; rainfall is very slight and spasmodic, though when it does occur it is in the form of showers which may be heavy.

In the open sea, fog and mist are rare except in the extreme eastern part of the Gulf of Aden during the South-West Monsoon season. Sand and dust haze are, however, widespread from June to August, visibility at this season being less than 5 miles on about 1 day in 10 in the northern part of the Red sea, 1 day in 4 or 5 in the southern part of the Red sea and on the African side of the Gulf of Aden, and 1 day in 2 on the Arabian side of that gulf. In September the frequency of haze decreases greatly, while from December to February it is not usual. Sandstorms, which north of about latitude 22° N. mostly occur from February to June, and in the southern part of the Red sea and in the Gulf of Aden from May to August or September, may occasionally reduce visibility to 50 yards or less.

THE PERSIAN GULF AND GULF OF OMAN

The following remarks apply to the open waters of the area away from the effects of the land, in the vicinity of which land and sea breezes (*see* Section A) and other local effects are likely to cause considerable modification. Detailed information concerning specific localities will be found in the Admiralty Sailing Directions.

In the main part of the Persian gulf, north-westerly (" Shamal ") winds are the most frequent in all seasons; they become more westerly in the southern part of the gulf or even south-westerly on the western side of the Strait of Hormuz. From December to February these north-westerlies are frequently interrupted by south-easterly winds blowing in advance of eastward moving depressions; thus, during the winter months an alteration between south-easterly and north-westerly winds is the characteristic feature. From March to May the south-easterly winds associated with depressions decrease rapidly in frequency, with a corresponding increase in the number of north-westerlies, which, from June to September are very persistent and form part of the cyclonic wind circulation around the summer " low " situated over North-west India. In October and November the north-westerlies become less steady as a gradual return to winter conditions brings an increasing frequency of south-easterly winds.

The average strength of the wind is Beaufort force 2–3 rising to force 3–4 in the north during the winter. The variations from the mean are, however, great and both calms and fresh to strong winds are rather common. Winds reach force 7 or above most often from December to March, during which period winds of this strength are likely to be experienced on about 3 days per month; they also occur occasionally in the summer, when they are due to a deepening of the summer " low " over North-west India, but they are rare in April, May and October. The winter gales may be from any direction, but those occurring in the summer are limited to directions between north and west. Squalls during which winds may reach gale force, are a characteristic feature of the weather of the Persian gulf and may occur in any month.

In the Gulf of Oman from December to February, winds are mainly from some northerly point with north-west as the most frequent direction. South-easterlies occur ahead of advancing depressions, but are less frequent here than in the Persian gulf. From March to May winds are very variable, with north-westerlies decreasing and south-westerlies increasing in frequency, until by May the latter winds predominate. From June to August the prevailing wind is south-easterly, being an offshoot of the South-West Monsoon of the Arabian sea. From September to November the frequency of south-easterly winds decreases and that of northerlies increases, but wind direction is, in general, very variable.

The frequency of calms is higher in the Gulf of Oman than in the Persian gulf; winds reach Beaufort force 7 on about 1–2 days per month from December to March, but rarely attain force 8. As in the Persian gulf squalls are common. On rare occasions the gulf may be affected by a tropical cyclone originating in the Arabian sea.

In both the Persian gulf and Gulf of Oman rain and large amounts of cloud are practically confined to the period November to April, and are associated with eastward moving depressions, in the intervals between which fine weather with small amounts of cloud prevail. In the summer months the Persian gulf is practically cloudless, but in the Gulf of Oman the influence of the monsoon causes an increase in cloudiness in July and August.

Visibility is for the most part good or very good from November to February; after the latter month however, dust haze results in a progressive deterioration until in June and July visibility is less than 5 miles on 10 to 12 days per month in the open sea, and still more often near the coast. Dust haze decreases considerably after July. Duststorms or sandstorms occur in all seasons, but are most frequent during the months of June and July and least so during the winter; during their occurrence they often reduce visibility to less than 500 yards.

SOUTH INDIAN OCEAN

The winds and weather of the northern part of the South Indian ocean are governed by the advance of the Doldrum belt, and behind it of the North Indian ocean monsoon, into the southern hemisphere during the southern summer, and their retreat northward during the southern winter; the result is the establishment, in this zone, of alternating seasonal winds. South of this belt the normal wind and pressure distribution as outlined in Section A prevails.

The Doldrums

The belt of the Doldrums is, in the Indian ocean, south of the equator from about November to April, and reaches its most southerly position in February (*see* Climatic Chart 5301). The winds and weather are similar to those encountered in the Doldrums in other oceans, and consist of calms and light variable winds alternating with squalls, heavy showers and thunderstorms. Both the width of the belt and its actual position vary considerably from day to day; the former averages about 200 miles, but it may at times be much more, while at others it may be reduced to almost nothing by a strong burst of the South-East Trade wind. Visibility in this zone is always good, except when reduced by heavy rain.

The North-West Monsoon or Cross Monsoon *(November to March).*

During the southern summer, when the Doldrums are situated in the southern hemisphere, the North-East Monsoon of the North Indian ocean is drawn across the equator, deflected to the left by the effect of the earth's rotation, and is felt in the area between the Doldrums and the equator as a north-westerly wind known as the North-West Monsoon or Cross Monsoon (*see* Climatic Chart 5301).

Winds are in general light and vary considerably in direction, but in the western part of the zone the prevailing direction is more nearly north than north-west, and becomes north-east close to the African coast and north of about latitude 10° S. In the Mozambique channel a northerly wind prevails as far as latitude 15° S.–17° S., and is here known as the Northerly Monsoon. In the eastern part of the ocean close south of Java, and in the Timor and Arafura seas the prevailing direction is between west and north-west.

Except in squalls which are common, or in association with tropical cyclones (*see* below), winds over the greater part of the zone are likely to reach force 7 or above only on rare occasions.

Weather is generally rather cloudy and unsettled and rain, mostly in the form of heavy showers, is frequent. Visibility is good except when reduced by rain.

The South-East Trade Wind

This wind forms the equatorial side of the great anti-clockwise circulation around the oceanic high pressure area situated in about latitude 30° S. In this ocean, however, the oceanic "high" seldom consists of a single cell; more frequently the high pressure area contains a more or less regular succession of eastward moving anticyclones, from the northern sides of which blow the trade winds; these blow permanently and with little variation in direction throughout the year.

In the southern summer the South-East Trades extend from about latitude 30° S. to the Doldrums, the general direction of the wind being from between east and south-east over most of the area, but becoming southerly off the west coast of Australia, and mainly south-westerly off its north-west coast—though in the latter area winds are much more variable than in the Trade winds proper. In the southern part of the Mozambique channel an extension of the trades gives prevailingly south to south-east winds. Climatic Chart 5301 shows the area covered by the trades at this season.

In winter the South-East Trades extend from about latitude 27° S. to the equator, though north of about latitude 5° S. and east of longitude 70° E. they are feeble, and, though generally from some southerly point, vary considerably in direction. Elsewhere over the greater part of the open ocean winds are almost exclusively from between south-south-east and east-south-east, but in the eastern part of the area and in the Timor sea the predominant direction is somewhat more easterly. In the Timor and Arafura seas the South-East Trade Wind is sometimes referred to as the South-East Monsoon in contradistinction to the North-West Monsoon which prevails there in the southern summer (*see* above). In the Mozambique channel an extension of the trade gives prevailingly south to south-east winds over the whole length of the channel from about April to September. These winds are known as the "Southern Monsoon" in contradistinction to the "Northern Monsoon" which prevails in the northern part of the channel in summer (*see* above under "North-West Monsoon"). Climatic Chart 5302 shows the area covered by the South-East Trade Wind at this season.

The average strength of the trade is Beaufort force 3–4 in the summer, rising to force 4–5 in the winter; it reaches a mean force of 5 between about latitude 10° S. and 20° S. and longitudes 65° E. and 100° E. at the height of this latter season. In the summer winds are likely to reach force 7 or above on 1–3 days per month over the greater part of the zone, rising to 3–6 days per month over the central part of the area. In winter winds of this strength are likely to be encountered on 1–3 days per month in the eastern and western parts of the zone, while over a considerable area between about longitudes 65° E. and 90° E. their frequency rises to 6–9 days per month, as indicated by the buff-tinted area on Climatic Chart 5302. In the Timor and Arafura seas winds are unlikely to reach force 7 on more than 1 or 2 days per month.

Weather in the open ocean is mostly fair or fine with skies about half covered, but belts of cloudy showery weather occur at intervals. To leeward of the Australian continent, between North-west Australia and Java, and in the Timor and, to a lesser extent, in the Arafura seas, during the season when the South-East Trade wind prevails in these regions (*i.e.* April to September), cloud amounts are small and rainfall very scanty. Extensive dust haze prevails here, especially in the Timor sea and towards the end of the season. Elsewhere in the South-East Trade zone visibility is good except when reduced by rain.

The Variables

Southward of the southern limit of the South-East Trade wind, there exists a zone of light variable winds in the belt covered by the oceanic high pressure region. In winter the centre of this belt is in about latitude 30° S., while in summer it moves to about latitude 35° S. over the greater part of the ocean dipping somewhat towards the south on approaching Australia.

Weather varies considerably in this zone, alternating between fair or fine conditions near the centres of the eastward moving anticyclones, and cloudy showery weather in the intervening troughs of low pressure. Visibility is generally good except when reduced by rain.

The Westerlies (Roaring Forties)

South of the belt of high pressure mentioned in the preceding paragraph, westerly winds predominate. As in the westerlies of other oceans however, the almost continuous passage of "lows" from a westerly towards an easterly point causes the winds to vary greatly both in direction and strength; the centres of the majority of these "lows" pass southward of latitude 50° S. Gales in the zone of the westerlies are very prevalent, especially in winter, during which season winds reach Beaufort 7 or above on 12–16 days per month southward of about the 36th parallel; in the summer months winds of this force are likely to be encountered on 6–12 days per month south of about latitude 40° S. The buff-tinted area on Climatic Charts 5301 and 5302 shows the region in which gales are most common.

As in the westerlies in other oceans, weather is very variable, periods of overcast skies and rain (or snow) associated with the fronts of eastward-moving depressions alternating with fairer conditions. Fine weather is, however, seldom prolonged and cloud amounts are generally large in all seasons.

Visibility also varies considerably; with winds from a southerly point it is generally good, while northerly winds are often associated with moderate or poor visibility. Southward of the 40th parallel visibility of less than 2 miles may be expected on perhaps 5 days per month, while fog is not uncommon during the summer months; it is usually associated with winds from a northerly point.

Tropical Storms (Cyclones.—Willy-willies)

A description of these dangerous storms is given in Section A, together with the precursory signs of their presence, and the action recommended to ships menaced by them.

In the South Indian ocean (where they are known as Cyclones), the great majority of storms occur from

December to April, the month of greatest frequency being January; they also occur occasionally in November and May.

In the Timor and Arafura seas and off the west coast of Australia these storms are known as Willy-willies; the season during which they occur and the month of maximum frequency is the same as for the Cyclones of the South Indian ocean, with the exception that Willy-willes are not known in May.

More detailed information regarding the frequency of these storms in different months and in specific localities will be found in the Admiralty Sailing Directions, and in the atlas of Monthly Meteorological Charts of the Indian ocean (M.O.M. 470) quoted at the beginning of this section.

CURRENTS

NORTH INDIAN OCEAN

The currents in the North Indian ocean are reversed in direction seasonally under the influence of the monsoons. These comprise the currents of the Arabian sea and Bay of Bengal, and the East African Coast current, between lat. 4° N. and Cape Guardafui. The only current which is not so reversed in direction is the Equatorial Counter-current, which lies mainly south of the equator, but extends a few degrees northward of it.

The South-West Monsoon circulation is established from May to September. October is a month of transition. The true North-East Monsoon circulation occurs during the height of that monsoon in November to January. The later north-east monsoon period, February to April, constitutes an extended transition period, in which an intermediate type of circulation is developed. The currents are therefore, described below for the three periods, November to January, February to April and May to September.

The North-East Monsoon Circulation *(November to January).*

In the open waters of the Arabian sea and Bay of Bengal, the current sets in a general westerly direction. Owing to the coastal conformation, the current flows round the coasts in a counter-clockwise direction. The coastal circulation of the Arabian sea is continued as a stronger current flowing southward along the east coast of Africa from Capo Guardafui to about lat. 3° S. This current, known as the East African Coast current, then turns eastward to form the beginning of the Equatorial Counter-current.

The later North-East Monsoon period *(February to April).*

During this period the resultant flow in the open waters of the Arabian sea and Bay of Bengal remains westerly, though the actual currents experienced are somewhat more variable than during November to January. The coastal circulation, both of the Arabian sea and Bay of Bengal is, however, reversed to a clockwise direction (*see* above). This reversal is completed in the Bay of Bengal by about the beginning of February. In the Arabian sea it is more gradual and is not complete on all parts of the coast until the end of March. The East African Coast current is also reversed by February and flows northward along the coast, from about lat. 4° N. to Capo Guardafui.

The South-West Monsoon circulation *(May to September).*

The clockwise circulation of the coastal region of the Arabian sea and Bay of Bengal persists and is strengthened. The East African Coast current also continues to flow northward up the coast, from Cabo Delgado to Capo Guardafui, and is greatly strengthened. In the open waters of the Arabian sea and Bay of Bengal the current sets in a general easterly direction. The East African Coast current divides in about lat. 7° N.; part continues along the coast to Capo Guardafui, but the bulk turns eastward and passes south of Socotra into the general easterly current. The current south of Socotra in July to September is probably the strongest in the world and rates up to 7 knots have been recorded.

The Equatorial Counter-current

As above stated, the Counter-current originates from the south-going East African Coast current in the earlier part of the North-East Monsoon period, November to January. Current observations throughout the year are not sufficiently numerous to determine the northern limit of this current in all longitudes. In November to January the easterly flow extends to lat. 2° N., westward of long. 60° E., but between that meridian and the coast of Sumatra it appears to extend to lat. 4° N., where observations are available.

In February to April, the Counter-current originates westward of the Seychelles, mainly by a recurvature of the general westerly flow of the southern part of the Arabian sea. Between Madagascar and the Seychelles a branch of the Equatorial current turns northward to contribute to the flow of the Counter-current. Westward of long. 80° E., the northern limit of the Counter-current appears to be south of the equator, but eastward of that meridian it reaches the equator, or to lat. 2° N.

In the South-West Monsoon season the Equatorial Counter-current cannot be distinguished in direction from the general easterly current of the Arabian sea and Bay of Bengal, but in the region of the Counter-current, from about lat. 2° N. southward, the rate of flow is stronger than in the general monsoon drift.

The course of the Counter-current on the eastern side of the ocean is not fully known. In November to January the bulk of it appears to follow the west coast of Sumatra and the south coast of Java, in south-easterly and easterly directions. In the South-West Monsoon period there is some evidence that part of it recurves to southward, in the region west of Sumatra, passing into the Equatorial current.

The Red sea and Gulf of Aden

The current conforms to the monsoon blowing at the time. During the North-East Monsoon the current sets westward in the Gulf of Aden and, passing through the Straits of Bāb-al-Mandab, flows up the axis of the Red sea. During the South-West Monsoon the current in the Gulf of Aden sets eastward. In the Red sea the water flows down the axis of the sea and into the Gulf of Aden.

SOUTH INDIAN OCEAN

The Main Circulation

The main surface current circulation of the South Indian ocean is counter-clockwise.

There is only one true Equatorial current in the Indian ocean, corresponding to the South Equatorial current of the Atlantic or Pacific ocean. The west-going flow of the Equatorial current of the Indian ocean lies well south of the Equator, thus differing from the South Equatorial currents of the Atlantic and Pacific, which extend in latitude to a few degrees north of the Equator. Its northern boundary is usually between lats. 6° S. and 10° S., varying according to longitude and season.

The west-going Equatorial current, after passing the northern extremity of Madagascar, meets the African coast in the region of Cabo Delgado. Here it divides, some of the water flowing northward along the coast. The remainder flows southward, forming a strong coastal current. From Cabo Delgado to Baia de Lourenço Marques (Delagoa bay) this current is known as the Moçambique current. Its southward continuation is known as the Agulhas current. This is reinforced by water from the Equatorial current setting past the southern extremity of Madagascar.

Some of the water of the Agulhas current recurves to south-eastward between about longs. 20° E. and 32° E. and so passes into the northern part of the Southern Ocean current. The remainder of the Agulhas current continues along the coastline and, passing over the Agulhas bank, enters the South Atlantic ocean, where it contributes to the flow of the Benguela current of that ocean.

The southern side of the main circulation is formed by the cold water of the Southern Ocean current, setting across the ocean in easterly to north-easterly directions, as far as about long. 80° E., and in easterly to south-easterly directions on the eastern side of the ocean. As above stated, some of the warm Agulhas current water also contributes to the southern side of the circulation, in the western part of the ocean. There is no defined northward boundary to the Southern Ocean current; the predominance of easterly sets decreases with decreasing latitude, in the central longitudes of the ocean, until it merges into the extensive region of variable current in the middle of the ocean southward of the Equatorial current. Some predominance of easterly set is found as far north at lat. 28° S. or 30° S. in the central longitudes.

The eastern side of the circulation is not well-marked. It is formed by the West Australian current, a weak north-westerly flow adjacent to the west coast of Australia. This passes into the Equatorial current in about lat. 16° S. to 20° S., long. 95° E. to 105° E. The Southern Ocean current on approaching Australia sends off a branch which passes into the West Australian current. The bulk of the Southern Ocean current continues its easterly course, southward of Australia and Tasmania into the South Pacific ocean.

The Equatorial Counter-current flows eastwards across the ocean throughout the year, immediately northward of the Equatorial current. It mainly occupies a belt southward of the Equator but during the North-East Monsoon season it also extends northward of the Equator. It is more directly connected with the currents of the North Indian ocean than with those of the South Indian ocean and is more fully described in relation to the former. *See* page 87.

The extreme eastern part of the Indian ocean

The currents in this part of the ocean, including the Arafura sea, are not well-known, owing to scarcity of observations. Eastward of Christmas island, between the parallels of about 10° S. and 12° S., there is a predominance of westerly sets, during the greater part of the year, forming the most easterly part of the Equatorial current.

ICE

General remarks

The following brief account of ice in the South Indian ocean should not be taken as complete or in any way all-embracing. More detailed information than can be given here will be found in the following publications, and these should be consulted before undertaking passages through areas in which ice is likely to be encountered:—

Chart 1,241.—Ice chart of the southern hemisphere.

Admiralty Sailing Directions covering the appropriate areas.

A general statement regarding ice, including warning signs of its proximity is given in section A of this book .

A factor always to be borne in mind where ice conditions are concerned is their great variability from year to year. For this reason, and also on account of the sparsity of observations in many areas, the charted positions of ice limits should only be regarded as approximate.

Ice that affects the mariner can be broadly divided into two main types, though there are numerous sub-types details of which will be found in the Admiralty Sailing Directions. These two main types of ice are:—

(a) Pack Ice—or frozen sea.

(b) Icebergs—or portions of ice that have broken off the seaward end of glaciers—or more frequently from the ice barrier, and been carried away by wind and current.

Pack Ice

The probable average position of the northern limit of Antarctic pack in March-April and August-September is indicated on Climatic Charts 5301 and 5302. None of the normally inhabited parts of the South Indian ocean are effected by it, but its presence prevents the sailing of a Great Circle track from Australian ports to the Cape of Good Hope.

Icebergs

The icebergs that occur in the South Indian ocean are not, in the great majority of cases, calved from glaciers, but consist of portions that have broken away from the great ice barrier. They are consequently flat-topped, and they may be of immense size.

The mean northern limit of bergs in November and December, in which months it reaches its furthest north between longitudes 20° E. and 70° E., runs from about latitude 44° S. in the longitude of Capetown to about latitude 48° S. in longitude 70° E. East of the 70th meridian the months of greatest extent are February and March, during which period the northern limit is between 48° S. and 50° S. as far as the 120th meridian, increasing to latitude 55° S. in the longitude of Tasmania. Northward of this mean limit, bergs are most likely to be encountered in August and September, in which months the extreme limit is nearly coincident with the 40th parallel as far east as the 120th meridian, from whence it bends southward to about latitude 50° S. in the longitude of Tasmania.

In May and June the mean limit of bergs is everywhere south of the 50th parallel, and between the 120th meridian and the longitude of Tasmania, it is south of latitude 55° S.

SECTION B. PART III.

Chapter II

ROUTES—THROUGH THE RED SEA

For Routes to Port Said from the Mediterranean sea, see Section B, Part II.

All routes in the Red sea to ports on its coasts are as direct as navigation permits. *See* Red sea and Gulf of Aden Pilot. The following is a general description of the through-routes of the Red sea, both southward bound and northward-bound.

Route 301. Suez southward through the Red sea

(1) SUEZ TO JABAL AT TĀIR.—Having cleared Suez bay keep over towards the western shore of the Gulf of Suez, taking care to pass well outside the shoal off Ras Za'farāna. From this point, still keeping over towards the western shore, steer to pass Ras Ghârib at a distance of about 2 miles and, after clearing the vicinity of Tor bank, to pass 2 miles eastward of Ashrâfi light structure, and 2 to 3 miles eastward of Shadwân island. From Shadwân island, the central passage through the Red sea as far as Jabal at Tāir is free from dangers, but the direct course passes nearer the eastern than the western side of the sea; therefore, after passing 2 to 3 miles eastward of The Brothers, and a convenient distance either side of Daedalus reef, it is advisable to steer for a position in lat. 17° 00′ N., long. 40° 40′ E., which lies about midway between the coastal banks, and thence to Jabal at Tāir, passing westward of that island.

CAUTION. It is especially necessary that the mariner should be on his guard against the effects of cross-currents, to which attention is directed on every Admiralty chart of the Red sea. No opportunity should be missed of checking the ship's position by astronomical observations, night and day; and it should be remembered that, on account of the excessive refraction known to exist in these waters, the most accurate results are those obtained at early twilight and dawn.

(2) JABAL AT TĀIR TO PERIM.—Continuing southward from abreast Jabal at Tāir, steer to pass westward of Zubair islands, noting that if steaming against a southerly gale, so commonly met with during the winter season, it is advisable to give them a berth of a mile, as the set of the swell is towards the rocks. From a position about 2½ miles south-westward of Centre Peak island, if bound for Abu 'Ali channel, shape course for the peak of Zuqar island, taking care to keep in a depth of over 100 fathoms (182^{m}9) until within about 28 miles of that island. When Zuqar island is distant about 13 miles, alter course to pass about 1¼ miles north-eastward of High island, and so into Abu 'Ali channel

From Abu 'Ali channel steer south-south-eastward to the Straits of Bāb-al-Mandab, passing about 2½ miles eastward of Low island and Fawn rock, and about 4 miles eastward of Mushajjara islet. Approaching the Straits of Bāb-al-Mandab, a vessel is recommended to steer to pass about 2 miles westward of Perim island, and so through the Large strait, which is to be preferred to the Small strait.

CAUTION. In the passage of this strait, it must be remembered that the current becomes very strong at certain seasons; the water running out of the Red sea from June to September, during the South-West Monsoon season, and running in to it from November to April, the North-East Monsoon season. During the strength of the monsoons, it may be expected to run at the rate of 40 miles a day.

(3) PERIM TO ADEN.—Having passed through the Straits of Bāb-al-Mandab, proceed to Aden as directly as safe navigation will allow.

Distance from Suez to Aden, 1,307 miles; to Jidda, 636 miles; to Massaua, 973 miles; to Perim, 1,211 miles; to Port Sudan, 694 miles.

Route 302. Aden northward through the Red sea

(1) ADEN TO SHADWÂN ISLAND.—Having passed through the Large strait of the Straits of Bāb-al-Mandab, follow Route 301 in reverse as far as The Brothers (*Lat. 26° 19′ N., Long. 34°51′ E.*), attention being paid to the cautions given in the description of that route. From The Brothers, steer direct for Shadwân island which can be generally seen about 30 miles off by day, or its light 20 miles or more by night.

CAUTION. In misty weather, after experiencing a westerly set, if Gifatin islands are sighted on a north-westerly bearing, they may be mistaken for Shadwân island; as the water is deep eastward of these islands, if in doubt pass near enough to identify Shadwân lighthouse, or its light by night, the non-existence of which would show that it was Gifâtin island.

(2) FROM SHADWÂN ISLAND TO SUEZ.—Proceed through the Strait of Gubal, and up the Gulf of Suez, following the reverse of Route 301, again keeping towards the western shore of the Gulf.

Note.—As north-westerly winds prevail in the Strait of Gubal, low-powered vessels may use with advantage the channels to the westward of Shadwân island. Using the largest scale chart, and keeping a good look out, there is no difficulty in navigating these channels by day. A full description will be found in the Red sea and Gulf of Aden Pilot.

See Caution following Route 301 (1).

Distance from Aden to Jidda, 701 miles; to Massaua, 399 miles; to Perim, 97 miles; to Port Sudan, 658 miles.

Route 303.—*Reserved as spare.*

Route 304.—*Reserved as spare.*

For Routes from Port Said to the Mediterranean, *see* Part II., Chapter II.

See Section D. Part II. Index on pages 349 and 350.

SECTION B. PART III

Chapter III

ROUTES FROM PORTS ON THE WESTERN SIDE OF THE INDIAN OCEAN

(i) ROUTES FROM ADEN

Route 305. Aden to the Persian gulf

While in the Arabian sea, follow a track as close to the Arabian coast as prudent navigation will allow, noting however the cautions in the Red sea and Gulf of Aden Pilot, especially regarding the Gulf of Masira, a close approach to which should be avoided.

From Ras al Hadd into, and up, the Persian gulf, follow the directions given in Chapter I. of the Persian Gulf Pilot under the heading " Passages."

CAUTION. During the South-West Monsoon the weather is generally very hazy along the Arabian coast so that, though the sky may be clear, the land may not be visible until close inshore. In the Persian gulf, during a shamāl in summer or while the nashi is blowing in the southern part of the Gulf in winter, the haze may obscure the land so completely that the surf on the beach may be the first intimation of its proximity.

Tropical storms, known as " cyclones," occur in the Arabian sea, being most frequent at the seasons of the change of monsoon. Details of these storms will be found in Chapter I. of the West Coast of India Pilot.

Distances from Aden are:—

To Ābādān, 1,936 miles; to Bahrein, 1,732 miles; to Basra, 1,965 miles; to Bushire, 1,792 miles; to Fao, 1,909 miles; to Jāsk, 1,328 miles; to Muscat, 1,203 miles.

Route 306. Aden to Karāchi

Follow Route 305 as far as a position to the southward of Kuria Muria (Khorya Morya) islands, or to long. 56° 00′ E., and thence proceed direct to Karāchi. Note the Cautions at the end of Route 305.

Distance from Aden to Karāchi, 1,470 miles.

Route 307. Aden to Bombay

(a) October to April.—After passing Ras Marshaq, take a direct Rhumb line track to a position midway between Khānderi island lighthouse and Prongs reef lighthouse.

CAUTION.—During the North-East Monsoon, there is considerable haze over Bombay in the mornings and evenings, and often throughout the day, obscuring everything from view. It is particularly noticeable during the interval between the land and sea breezes.

(b) May to September.—Take Rhumb line tracks first to a position in lat. 13° 00′ N., long. 55° 00′ E,. and thence to make Khānderi island.

CAUTION.—During the South-West Monsoon a northerly set may be expected in making the land off Khānderi island.

Distance from Aden to Bombay by (a), 1,657 miles; by (b), 1,682 miles.

Route 308. Aden to Colombo

(a) West of Socotra.—October to April.—Steer first for a position lat. 12° 25′ N., long. 50° 30′ E. and from thence, as direct as navigation permits, to destination, passing through the Eight Degree channel.

(b) North of Socotra.—May to September.—Steer first for a position lat. 13° 00′ N., long. 55° 00′ E., and from thence direct to destination.

Notes.—The passage through the Eight Degree channel should be made nearer to Minicoy (Minikoi) island than to the Maldives.

A heavy cross sea will be found southward of Socotra during the South-West Monsoon.

Distance from Aden to Colombo by (a), 2,094 miles; by (b), 2,116 miles.

Route 309. Aden to ports in the Bay of Bengal

(a) October to April.—Follow Route 308 (a) to lat. 8° 06′ N, long. 73° 00′ E, south of Minicoy in the Eight Degree channel, and from thence proceed on a Rhumb line track to a position south of Dondra head, the southernmost point of Ceylon, in lat. 5° 50′ N., long. 80° 36′ E. From this point proceed to all ports in the Bay of Bengal as directly as safe navigation permits.

CAUTION.—The currents in the vicinity of Dondra head are irregular within 2 miles of the coast, and there may be an indraught to the west of the head.

(b) May to September.—Proceed as in Route 308 (b) to lat. 13° 00′ N., long. 55° 00′ E., and thence direct to the Eight Degree channel to join (a) above.

Distances from Aden are:—

To Calcutta (near Pilot station, Hooghly river), by (a), 3,177 miles; by (b), 3,187 miles.

To Madras, by (a), 2,659 miles; by (b), 2,669 miles.

To Rangoon (China Bakir L.V.) (*Lat. 16° 00′ N., Long. 96° 14′ E.*), by (a), 3,241 miles; by (b), 3,251 miles.

Note.—The distance onwards to Calcutta or Rangoon from the above position is 125 miles (approx.), and 50 miles (approx.) respectively.

Route 310. Aden to Singapore (a) and (b), or to Penang ((a) only)

(a) Via Malacca strait.—Follow Route 309, according to season, as far as Dondra head, and thence take a Rhumb line track to a position in lat. 5° 49′ N., long. 95° 00′ E., to the west of Bengal passage. From Bengal passage continue through Malacca passage and thence proceed direct to Penang, or as direct as navigation will allow down the Malacca straits to Singapore. *See* notes at the end of Route 402.

(b) Via Straat Soenda (Sunda). Full-powered ships. (i) October to April.—Steer first for lat. 12° 25′ N., long. 50° 30′ E., thence past Capo Guardafui to a position in lat. 5° 20′ N., long. 73° 15′ E., in the One-and-a-half degree channel, in the southern Maldive islands, thence to lat. 6° 25′ S., 102° 30′ E., and thence into Soenda straat. For continuation to Singapore *see* the notes after (b) (v) below.

(ii) Full-powered ships.—May to September.—Steer first for lat. 13° 00′ N., long. 55° 00′ E., thence to a position off Minicoy island in lat. 8° 06′ N., long. 73° 00′ E., thence to lat. 5° 40′ N., long. 80° 00′ E., off Point de Galle; thence proceed to a position in lat. 5° 15′ S., long. 102° 30′ E., or in lat. 6° 25′ S., long. 102° 30′ E., depending on whether the approach to Soenda straat is to be made to the north, or to to the south of Telanjang (Enggano). For continuation to Singapore *see* the notes after (b) (v) below.

(iii) Low-powered ships.—October to April.—Steer from Aden to lat. 12° 25′ N., long. 50° 30′ E., thence past Capo Guardafui, to round the southern

See Section D. Part II. Index on pages 349 and 350.

Maldive islands, passing through lat. 1° 00′ S., long. 72° 20′ E., and then making for lat. 2° 20′ S., long. 76° 30′ E. From this point steer for lat. 3° 00′ S., long. 94° 30′ E., and thence to Soenda straat, passing north of Telanjang (Enggano) through lat. 5° 15′ S., long. 102° 30′ E., or south of the same through lat. 6° 25′ S., long. 102° 30′ E.

(iv) Low-powered ships.—Alternative route, October to February only.—From off Capo Guardafui *(see* (iii) above), steer for a position in lat. 3° 00′ N., long. 60° 00′ E., and thence on a curving course to lat. 1° 40′ S., long. 68° 20′ E., crossing the Equator in long. 64° 30′ E. *(see* Chart 5306). From this point steer to join (iii) above in lat. 2° 20′ S., long. 76° 30′ E.

Note.—The distance on this route is about 55 miles longer than that in (iii) above; on the other hand the Equatorial counter-current may be picked up earlier and may be of greater strength.

(v) Low-powered ships.—May to September.—Steer as in (ii) to the position off Point de Galle and from thence to cross the equator at long. 96° 30′ E. From this point, the route may be taken either between the main coast of Sumatra and the off-lying islands, or directly to the westward of the islands into Soenda straat. Smoother water will be found in the inner route. *See* notes on passages on the west coast of Sumatra to be found in Chapter I. of Malacca strait Pilot. *Also see* Route 403 (b) (iii).

The distance to Soenda straat by this route is about 20 miles longer than that given below for (ii) *via* lat. 5° 15′ S., long. 102° 30′ E.

Notes.—The shortest route from Soenda straat to Singapore is through Banka, Berhala, and Doerian straten, although some vessels prefer to go through Abang straat and Riouw (Rhio) straat instead of through Doerian straat. An alternative route from Soenda straat is to pass to the east of Lingga Archipel, and thence through Riouw straat. *See* Eastern Archipelago Pilot, Vol. IV.

To the China sea.—From Soenda straat the customary route is through Stolze straat and then eastward of the Pengiki eilanden. *See* Eastern Archipelago Pilot, Vol. IV. and China Pilot, Vol. II.

To the Pacific ocean.—For routes onward from Singapore to the Pacific ocean, *see* Part IV., Chapter II.

Note.—Many details of the various straits of the Eastern archipelago can be found in Chapter II. of Section C., Part II.

Distances from Aden by the routes described above:—

Route (a) (via Malacca strait), using Route 309 (a). —To Bengal passage (*Lat. 5° 49′ N., Long. 95° 00′ E.*), 3,012 miles; to Penang, 3,339 miles; to Singapore, 3,632 miles.

Route (b) (via Soenda straat, lat. 6° 25′ S., long. 105° 00′ E.).—To Soenda straat *via* lat. 5° 15′ S., long. 102° 30′ E., by (b) (ii), 3,795 miles; by (b) (iii), 3,858 miles. To Soenda straat, *via* lat. 6° 25′ S., long. 102° 30′ E., by (b) (i), 3,765 miles; by (b) (ii), 3,811 miles; by (b) (iii), 3,868 miles.

From position lat. 5° 15′ S., long. 102° 30′ E., to Soenda straat, is 164 miles.

From position lat. 6° 25′ S., long. 102° 30′ E. to Soenda straat is 149 miles.

From Soenda straat (*Lat. 6° 25′ S., Long. 105° 00′ E.*) to Singapore is 585 miles.

Route 311. Aden to Northern Australian ports

Follow Route 310 (b) (i) to (v), according to season and to power available, as far as either lat. 5° 15′ S., long. 102° 30′ E., or lat. 6° 25′ S., long. 102° 30′ E., according to route; thence continue by one of the routes that follow:—

(a) Pass through Soenda straat, and then steer along the north coast of Java and, passing through Sapoedi and Wètar straten, proceed as directly as navigation permits to destination.

(b) Steer to round the south-west point of Java, and thence along its south coast and through Roti straat, south of Timor; thence proceed as directly as navigation will permit to destination.

Instead of passing through Roti straat, a vessel can continue along the coast of Java, and pass through Soemba straat, between Soemba and Flores into the Sawoe (Savu) Sea; thence steer through Ombai straat and Wètar straat and round the north-east point of Timor. From this point proceed direct to Carpentaria light vessel, passing 15 miles northward of the reported site of Victoria shoal; thence continue direct to Thursday island.

Note.—The above alternative passage through Soemba, Ombai, and Wètar straten was successfully taken from east to west in September 1948 by the P. & O. s.s. "Perim," Master, J. C. Mellonie, who recommended the route strongly. Except that the adverse current may be somewhat stronger in these narrower seas, there appear to be many advantages for taking the route from west to east as well. No difficulty was experienced in fixing the ship's position, and, between Timor and Carpentaria light vessel, a course can be laid through safer waters than the passage from Roti straat appears to afford, from the numerous established and reported shoals lying near the track.

The route is recommended, therefore, both for east-bound and west-bound vessels.

The passage through Ombai straat is described in Route 1,136. *See* also Route 447 (c).

(c) First proceed as directly as navigation permits to a position in lat. 11° 30′ S., long. 118° 00′ E.; and thence to destination.

Distance from Aden (using Route 310 (b) (i), *via* lat. 6° 25′ S., long. 102° 30′ E., to Port Darwin by (a), 5,459 miles; by (b), 5,342 miles; by (c), 5,345 miles; to Thursday island by (a), 6,026 miles; by (b), 6,003 miles; by (c), 6,018 miles.

Notes.—There is little difference in the distance if the passage is made *via* lat. 5° 15′ S., long. 102° 30′ E.

The passage from Aden to Thursday island may be made also via Malacca straits and Singapore. *See* Routes 310 (a), and 441. The total distance is about 120 miles longer.

See Chapter II. of Section C., Part II. for many details of the various straits in the Eastern archipelago.

For routes onward from Thursday island to ports in the Pacific *see* Part IV., Chapter II.

Route 312. Aden to Fremantle

All seasons.—Steer first for a position in lat. 12° 25′ N., long. 50° 30′ E., and after rounding Capo Guardafui, take a Rhumb line track to lat. 4° 00′ S., long. 73° 30′ E., about 120 miles north-east of Chagos archipelago, and thence follow a Great Circle direct to Fremantle.

Distance from Aden to Fremantle 4,923 miles.

Route 313. Aden to Cape Leeuwin, South Australian ports and Sydney

(1) To CAPE LEEUWIN.—Follow Route 312 above to lat. 4° 00′ S., long. 73° 30′ E., and then take the Great Circle direct to a position in lat. 34° 37′ S., long. 115° 08′ E., about 15 miles southward of Cape Leeuwin.

CAUTION. Attention is drawn to the paragraphs on currents near, and to the directions for rounding, Cape Leeuwin, which will be found in Australia Pilot, Vols. I. and V. and under Route 452.

From the position off Cape Leeuwin in (1) above proceed as follows to South Australian ports:—

(2) To ALBANY.—Steer direct for that port.

(3) To ADELAIDE.—Get on to and follow eastwards the parallel of 35° 30′ S., to Investigator strait, and thence as direct as navigation permits to Adelaide. *See* Australia Pilot, Vol. I.

(4) To MELBOURNE OR SYDNEY.—Follow a Great Circle track to a position off Cape Otway, and thence proceed as direct as navigation will permit to Port Philip or Sydney (*see* Route 475). *See* Australia Pilot, Vol. II.

(5) To HOBART.—Follow a Great Circle track to a position in lat. 43° 40′ S., long. 146° 00′ E., about 5 miles southward of South West cape. Thence proceed to Hobart as directly as navigation permits round South East cape and then, either through D'Entrecasteaux channel, or round Cape Tasman and through Storm bay. *See* Australia Pilot, Vol. II.

Note.—The direct Great Circle track from lat. 4° 00′ S., long. 73° 30′ E. to lat. 43° 40′ S., long. 146° 00′ E., off South West cape, can be taken instead of the above if desired. This track passes about 35 miles south of Cape Leeuwin; it is only a few miles shorter.

CAUTION.—*Ice.*—*See* notes in South Indian Ocean Pilot.

Distance from Aden to Adelaide, 6,133 miles; to Albany, 5,137 miles; to Cape Leeuwin, 4,968 miles; to Hobart, 6,594 miles; to Melbourne, 6,469 miles; to Sydney, 6,928 miles.

Route 314. Aden to New Zealand

Follow Route 312 to lat. 4° 00′ S., long. 73° 30′ E., and then take the Great Circle track to join Route 350, Cape Town to New Zealand, in lat. 45° 00′ S., long. 130° 00′ E.

Distance from Aden to a position east-north-eastward of The Snares in lat. 47° 50′ S., long. 167° 50′ E., 7,252 miles.

Route 315.—*Reserved as spare.*

Route 316. Aden to Mauritius

(a) Full-powered vessels.

All seasons.—Proceed direct to Capo Guardafui, and thence as direct as navigation will permit, calling if necessary at Seychelles for fuel (coal and diesel oil only).

(b) Low-powered vessels.

(i) October to March.—Proceed along the Arabian coast until able to weather Capo Guardafui, or direct to a position in lat. 12° 25′ N., long. 50° 30′ E. and thence steer to round Capo Guardafui; from thence run through the North-East and North-West Monsoons, cross the Equator in about long. 64° 00′ E., and thence steer to join (ii) below in lat. 10° 00′ S., long. 70° 00′ E.

(ii) April to September.—Steer first to pass north of Socotra, and thence south-eastward, running through the South-West Monsoon, to cross the Equator in about long. 72° E., or even to pass through the One-and-a-half Degree channel. From either of these positions make southing into the South-East Trade and, passing eastwards of the Chagos archipelago, proceed direct to Mauritius passing through lat. 10° 00′ S., long. 70° 00′ E.

Distance from Aden to Mauritius by (a), 2,336 miles; by (b) (i), 2,968 miles; by (b) (ii), 3,458 miles.

Route 317. Aden to Seychelles

(a) Full-powered vessels.

All seasons.—Proceed direct to, and round Capo Guardafui, and thence direct to destination.

(b) Low-powered vessels.

(i) October to March.—Follow Route 316 (b) (i) as far as Capo Guardafui, and thence proceed direct to destination.

(ii) April to September.—Follow Route 310 (b) (iv) to lat. 3° 00′ N., long. 60° 00′ E., and thence steer due south across the Equator and having picked up the South-East Trade, proceed direct to destination.

Note.—If the South-West Monsoon is still blowing strongly when lat. 3° 00′ N., long. 60° 00′ E. is reached, a vessel should hold the south-easterly course until its strength has been lost, when she should turn southward across the Equator and so to destination as before.

Distance from Aden to Mahé, Seychelles by (a), 1,400 miles; by (b) (i), 1,410 miles; by (b) (ii), 1,740 miles (approximately).

Route 318. Aden to Mombasa or Zanzibar

Steer for position lat. 12° 25′ N., long. 50° 30′ E., and thence as direct as navigation permits round Capo Guardafui, following the trend of the coast.

Distance from Aden to Mombasa, 1,602 miles; to Zanzibar, 1,722 miles.

Route 319. Aden to Durban or Cape Town

(a) Direct.—After rounding Capo Guardafui, as in Route 318, steer direct for lat. 11° 35′ S., long. 42° 50′ E., off the western side of Iles Comores (Comoro islands). Steer direct from thence, in the full strength of the south-going current, for lat. 25° 00′ S., long. 35° 30′ E., passing about 30 miles from the land abreast of Pôrto de Moçambique, and thence as directly as navigation permits, to destination.

If bound to Cape Town, keep at about 20 to 30 miles from the coast, so as to get full benefit of the Agulhas current, and from abreast Mossel bay shape course to round Cape Agulhas at a safe distance and thence for rounding the Cape of Good Hope.

CAUTION.—In the event of meeting a south-westerly gale on the latter part of the route, a very dangerous sea will be experienced at or outside the edge of the 100-fathom ($182^{m}9$) bank. Considerably less sea is experienced if a vessel can keep near the coast, about 3 miles (or less if possible) offshore; the reduction in the sea more than compensates for the loss of the favourable current. At night, however, keep in depths of more than 40 fathoms ($73^{m}2$).

(b) Low-powered vessels.—May to September.—After rounding Capo Guardafui, as above, steer through lat. 8° 00′ N., long. 52° 40′ E., to lat. 1° 10′ N., long. 55° 00′ E. Thence proceed direct to lat. 11° 35′ S., long. 42° 50′ E., off Iles Comores (Comoro islands) (*see* (a) above), and from this point, the route is the same for all steamers.

Note.—The increase in distance over Route (a) above is about 220 miles; but the strength of the South-West Monsoon, and of the north-easterly current, will be avoided.

Distance from Aden by (a), to Durban, 3,169 miles; to Cape Town, 3,959 miles.

For routes onward from Cape Town into the Atlantic ocean, *see* Part I., Chapter II.

Route 320.—*Reserved as spare.*

(ii) ROUTES FROM MOMBASA, OR ZANZIBAR

Route 321. Mombasa or Zanzibar to Aden

Take a route as direct as navigation permits, following the trend of the African coast at a convenient distance from it, and keeping in the strength of the north-going current, which will be carried generally to the Equator during the North-East Monsoon, and to Capo Guardafui in the South-West Monsoon. From Capo Guardafui proceed direct to Aden. *See* Cautions in Route 399, Colombo to Aden.

Distance to Aden from Mombasa, 1,602 miles; from Zanzibar, 1,722 miles.

For continuation into the Red sea, *see* Route 302.

Route 322. Mombasa or Zanzibar to Persian gulf or Karāchi

Follow the trend of the African coast as far as the Equator, and then make for lat. 8° 00′ N., long. 52° 40′ E., from which point shape a course to pass not less than 50 miles eastward of Socotra island. Thence proceed as directly as navigation permits to destination.

For full information regarding the approaches to Karāchi, and to the Persian gulf as well as directions for passages in the latter, *see* West Coast of India Pilot, and Persian Gulf Pilot respectively. *See also* the remarks and cautions to be found in Route 305, Aden to the Persian gulf.

Distances from Mombasa are:—

To Ābādān, 2,847 miles; to Bahrein, 2,643 miles; to Basra, 2,876 miles; to Bushire, 2,703 miles; to Fao, 2,820 miles; to Jāsk, 2,239 miles; to Karāchi, 2,359 miles; to Muscat, 2,114 miles.

Route 323. Mombasa or Zanzibar to Bombay

(a) October to April.—Steer first to lat. 2° 30′ S., long. 44° 50′ E., and thence on the direct Rhumb line to Bombay.

(b) May to September.—Follow the trend of the African coast, at a distance from it of about 50 miles, as far as lat. 1° 30′ N., long. 45° 50′ E., and thence steer the direct Rhumb line track to Bombay.

Distance from Mombasa to Bombay by (a), 2,400 miles; by (b), 2,373 miles.

Route 324. Mombasa or Zanzibar to Colombo, Malacca strait and ports in Bay of Bengal

All seasons.—Steer on Rhumb line to a position in lat. 1° 20′ N., long. 73° 15′ E., in One-and-a-half-degree channel in the Maldive islands and, after passing through it, as directly to destination as navigation permits.

Distances from Mombasa are:—

To Calcutta, 3,701 miles; to Colombo, 2,558 miles; to Madras, 3,075 miles; to Penang, 3,693 miles; to Rangoon, 3,672 miles; to Singapore, 3,985 miles.

Route 325. Mombasa or Zanzibar to Seychelles

(a) Usual route.—Full-powered vessels.—Follow a Rhumb line direct.

(b) Alternative routes.—Low-powered vessels.

(i) October to April.—Keep northward of the direct route until the North-West Monsoon is picked up in about long. 45° E.; thence proceed direct to destination.

(ii) April to October.—If unable to fetch the islands on the direct route, continue on past them, until able to make them from the northward.

Distance from Mombasa to Mahé by (a), 969 miles; from Zanzibar, 1,019 miles.

Route 326. Mombasa or Zanzibar to Mauritius

(a) Usual route. Full-powered vessels.—Follow Rhumb line tracks as direct as navigation permits.

(b) Alternative routes.—Low-powered vessels.

(i) November to April.—Keep northward of a line joining the port of departure with the north limit of the Seychelles until the North-West Monsoon is picked up; thence make eastwards to join Route 316 (b) (i) in lat. 10° 00′ S., long. 70° 00′ E.

(ii) April to October.—Steer to pass northward of the Seychelles, making as much easting as possible, but regardless of crossing the Equator if necessary; continue to the eastward to join Route 316 (b) (ii) and pass eastward of the Chagos archipelago.

Distance from Mombasa to Port Louis, Mauritius by (a), 1,424 miles.

Route 327. Mombasa or Zanzibar to Durban or Cape Town

Steer first for lat. 11° 35′ S., long. 42° 50′ E., off Iles Comores, in order to avoid the coastal current setting northward from Cabo Delgado. From this point (off Iles Comores), steer direct, keeping in the strength of the Mozambique current *(see* Route 319 (a)), to destination.

Distance from Mombasa to Durban, 1,771 miles; to Cape Town, 2,561 miles.

For routes onward from Cape Town to ports in the Atlantic ocean, *see* Part I, Chapter II.

Route 328.—*Reserved as spare.*

(iii) ROUTES FROM DURBAN

Route 329. Durban to Mombasa

Steer first out from the coast across the Mozambique current to lat. 27° 15′ S., long. 36° 00′ E., and thence northward, to lat. 17° 00′ S., long. 42° 15′ E., off Ile Juan de Nova, passing 30 miles westward of Bassas da India. From the position off Ile Juan de Nova, steer for lat. 11° 35′ S., long. 42° 50′ E., off Iles Comores, and from thence as directly to destination as navigation permits.

Distance from Durban to Mombasa, 1,826 miles.

Route 330. Durban to Aden

Proceed as in Route 329 to the position off Iles Comores, and thence as directly as navigation permits, round Capo Guardafui, to Aden. *See* South Indian Ocean Pilot, Africa Pilot, Part III, and Red Sea and Gulf of Aden Pilot; also cautions in Route 399.

Distance from Durban to Aden, 3,224 miles.

For continuation from Aden into the Red sea, *see* Route 302.

Route 331. Durban to Persian gulf or Karāchi

Proceed as in Route 329 to the position off Iles Comores, and thence on Rhumb line tracks, as directly as navigation permits, to destination, passing not less than 50 miles from the eastern end of Socotra. *See* remarks and cautions in Route 305.

Distances from Durban are:—

To Ābādān, 4,453 miles; to Bahrein, 4,249 miles; to Basra, 4,482 miles; to Bushire, 4,254 miles; to Fao, 4,426 miles; to Jāsk, 3,945 miles; to Karāchi, 3,881 miles; to Muscat, 3,720 miles.

Route 332. Durban to Mauritius

Steer on a Rhumb line to a position 120 miles from the south-east point of Madagascar, in lat. 26° 50′ S., long. 47° 40′ E., and thence on a second Rhumb line to destination.

Distance from Durban to Mauritius, 1,590 miles.

Route 333. Durban to Bombay

(a) All seasons.—Follow Route 329 as far as lat. 17° 00′ S., long. 42° 15′ E., off Ile Juan de Nova to join Route 341 (a), Cape Town to Bombay.

(b) Alternative Route.—Follow Route 332 to lat. 26° 50′ S., long. 47° 40′ E., to join Route 341 (b).

Distance Durban to Bombay by (a), 3,810 miles; by (b), 3,913 miles.

Route 334. Durban to Colombo, Madras, Calcutta or Rangoon

(a) West of Madagascar.—Proceed as in Route 329 to lat. 17° 00′ S., long. 42° 15′ E., off Ile Juan de Nova, and thence:—

(i) April to October.—Follow Route 343 (a) (i).

(ii) July to February.—Follow Route 343 (a) (ii).

(b) East of Madagascar.—Follow Route 332 to lat. 26° 50′ S., long. 47° 40′ E., and thence:—

(i) May to September.—Follow Route 343 (b) (i).

(ii) November to March.—Follow Route 343 (b) (ii).

Distances from Durban are:—

To Calcutta, by (a) (i), 4,806 miles; by (b) (i), 4,758 miles; by (b) (ii), 4,688 miles.

To Colombo, by (a) (i), 3,652 miles; by (b) (i), 3,658 miles; by (b) (ii), 3,580 miles.

To Madras, by (a) (i), 4,145 miles; by (b) (i), 4,063 miles; by (b) (ii), 4,043 miles.

To Rangoon, by (a) (i), 4,811 miles; by (b) (i), 4,708 miles; by (b) (ii), 4,688 miles.

Note.—The distances by (a) (ii) are about 100 miles more than by (a) (i) in each case.

Route 335. Durban to Singapore or China sea

(a) Via Soenda (Sunda) straat.—All seasons.

(i) Main Route.—Proceed on the parallel of 30° 00′ S. to long. 56° 40′ E., to join the Great Circle track in Route 344 (a) (i).

(ii) Alternative Route.—Proceed on the parallel of 30° 00′ S., to join Route 344 (a) (ii) in lat. 30° 00′ S., long. 54° 00′ E.

(b) Via Malacca strait.—All seasons.—Follow Route 332 to Mauritius to join Route 344 (b).

Distance from Durban to Penang by (b), 4,589 miles; to Singapore by (a) (i), 4,923 miles; by (b), 4,884 miles; to Soenda straat, by (a) (i), 4,338 miles. The distance by (a) (ii) to Singapore or Soenda straat is about 200 miles greater than the above.

For routes onward from Singapore to ports in the Pacific *see* Part IV., Chapter III.

See Chapter II. of Section C., Part II., for details of many of the channels through the Eastern archipelago.

Route 336. Durban to Northern Australia

Take a Great Circle track direct to a position in lat. 15° 30′ S., long. 120° 00′ E., and thence proceed as directly as navigation permits to Port Darwin or Thursday island. If bound to Broome or to King Sound (Cape Leveque) leave the Great Circle on reaching long. 113° 00′ E. in about lat. 19° 00′ S., and proceed as directly as navigation permits to destination.

Distance from Durban to Broome, 4,968 miles; to King sound (Cape Leveque), 5,025 miles; to Port Darwin, 5,575 miles; to Thursday island, ,6,269 miles.

The distance from Durban to lat. 15° 30′ S., long. 120° 00′ E. is 4,887 miles; to lat. 19° 00′ S., long. 113° 00′ E., it is 4,434 miles.

Note.—During the Willy-willy season off the North and North-west coasts of Australia (November to April), the Great Circle track may be taken to lat. 11° 30′ S., long. 118° 00′ E. The distance to Thursday island will be increased by about 65 miles; to Port Darwin by about 85 miles. If bound to Broome or King sound leave the Great Circle in about lat. 18° 00′ S., long. 105° 00′ E. and proceed as directly as navigation permits to destination.

Route 337. Durban to Fremantle, Adelaide, Melbourne or Hobart

(a) Summer months.—Proceed on a Great Circle track to lat. 40° 00′ S., long. 77° 00′ E., and thence follow, according to destination, Route 346 (a), 347 (a), 348 (a) (i), or 349 (a) (i).

(b) Winter months.—See note at the beginning of Route 346 (b).—Take a Great Circle track to lat, 35° 30′ S., long. 67° 30′ E. to join Route 346 (b). 347 (b), 348 (b) or 349 (b).

Distance from Durban to Adelaide by (a), 5,218 miles; by (b), 5,339 miles; to Fremantle by (a), 4,243 miles; by (b), 4,262 miles; to Hobart by (a), 5,532 miles; by (b), 5,775 miles; to Melbourne (port), by (a), 5,464 miles; by (b), 5,653 miles.

Route 338. Durban to Cape Town

Proceed as directly as navigation permits, keeping at a distance of about 20 to 30 miles from the coast in the strength of the Agulhas current, but *see* caution following Route 339.

Distance from Durban to Cape Town, 800 miles.

For Routes onward from Cape Town to ports in the Atlantic ocean, *see* Part I., Chapter II.

(iv) ROUTES FROM CAPE TOWN

For Routes from or to Cape Town to or from the Atlantic Ocean, *see* Part I, Chapters II and III.

Route 339. Cape Town to Durban

General remarks.—Keep as close to the land as safe navigation permits, in order to be out of the strength of the Agulhas current. A counter-current will sometimes be found extending from one mile to six miles off shore between Cape Agulhas and Kowie river; also, within 3 miles of the coast between Port Shepstone and Cape Natal (Durban bluff), a northerly set is sometimes experienced during westerly winds.

It is important, when proceeding northward, to hug the coast, not only to avoid the adverse current, but also to avoid the heavy seas when southerly and westerly winds prevail. All salient points, however, must be avoided, and watch kept against indraught into bays.

Route.—Having rounded the Cape of Good Hope, steer to pass within range of Cape Agulhas light, and then make a straight course to Cape St. Francis. From this point, keep well within soundings up the coast to Cape Hermes (*Lat. 31° 38′ S., Long. 29° 33′ E.*), so that the north-going counter-current may be taken full advantage of, both while the vessel is to the southward, and also while approaching Durban from Shepstone lighthouse. If close to the land, the main current, flowing south, is hardly felt. When nearing Cape Natal (*Lat. 29° 53′ S., Long. 31° 04′ E.*), also known as " The Bluff," a strong set-off from the land may be expected, according to the strength of the main southerly set. This is due to the contour of the coast at this point.

CAUTION.—During the season of southerly gales, a very heavy sea will probably be encountered off the coast near East London (*Lat. 33° 02′ S., Long. 27° 55′ E.*), caused by the strong south-west-going current setting against the wind. The most dangerous sea will be experienced at, or just outside, the edge of the 100 fathom (182$^{\mathrm{m}}$9) line. Considerably less sea is experienced if a vessel can keep near the coast. At night, however, vessels should keep in depths of more than 40 fathoms (73$^{\mathrm{m}}$2).

Distance from Cape Town to Durban: 800 miles.

Route 340. Cape Town to Mombasa, Aden, Persian gulf, or Karāchi

(a) Direct route.—Follow Route 339 above until approaching Durban and, when abreast of that port, edge off to a distance of about 100 miles from the coast, where the current is weak, and thence steer direct for the middle of the Moçambique channel, following the route given in Route 329, to the position in lat. 11° 35′ S., long. 42° 50′ E., off Iles Comores. From that point the routes are the same as from Durban, *see* Routes, 329, 330, and 331.

(b) Alternative Route.—From Cape Town steer southwards for 150 miles across the Agulhas current to lat. 36° 45′ S., long. 19° 00′ E. This is the point whence departure is made for the Soenda (Sunda) straat, or for Australia (*See* Routes 344 to 350). From it steer first (on the Great Circle track for Soenda straat) to lat. 34° 30′ S., long. 32° 30′ E.,

and thence on a Rhumb line (but keeping nothing to westward) to cross lat. 30° 00′ S. at long. 38° 20′ E., and making northward thence, in the full strength of the Madagascar current to the point off Juan de Nova island (*Lat. 17° 00′ S., Long. 42° 15′ E.*), mentioned in Route 329. The routes onwards to destination are as given in Routes 329, 330, and 331.

Notes.—By the above Alternative route the Agulhas current may be avoided altogether, and full advantage taken of the Madagascar current setting northward up the eastern side of the Moçambique channel.

The distances to all ports by the Alternative route are about 275 miles greater than those by the Direct route.

Distances from Cape Town by (a) (Direct route) are:—

To Aden, 4,014 miles; to Fao, 5,216 miles; to Karāchi, 4,726 miles; to Mombasa, 2,616 miles.

For continuation northward from Aden *see* Route 302.

Route 341. Cape Town to Bombay

(a) All seasons.—Proceed either by Route 340 (a) or (b), to the position in lat. 17° 00′ S., long. 42° 15′ E., off Ile Juan de Nova in the Moçambique channel. (If a route eastward of Ile Europa, in the Moçambique channel be taken, though the distance would be about 40 miles greater, the currents would be found to be more favourable). From this point, pass between Ile Anjouan and Ile Mayotte (Iles Comores), to a position 30 miles westward of Aldabra island, paying due attention to the west-going current. From Aldabra, take a direct Rhumb line track to Bombay, crossing long. 60° 00′ E., at lat. 5° 50′ N. *See* Cautions under Route 307.

Note.—The above Route, eastward of Ile Anjouan, and westward of Aldabra island, should always be taken at night, owing to the strong and uncertain westerly setting current in this locality; but, by day, after passing Ile Anjouan, a vessel may pass westward of the Cosmoledo group, and thence direct to Bombay or Karāchi.

If calling at Seychelles islands, after passing Ile Juan de Nova, steer direct as possible for Seychelles, and thence to Bombay; the distance, in this case, will be increased by about 25 miles.

(b) Alternative Route.—Proceed first to a position about 60 miles to the south of Cape Agulhas, and keep at this distance from the coast until reaching the meridian of 27° E. in about lat. 35° 00′ S.; thence steer direct for a position in lat. 26° 50′ S., long. 47° 40′ E., south-east of Madagascar. From this point steer to pass westward of Reunion, Mauritius and Saya de Malha bank direct to Bombay, calling at Mauritius or Seychelles for coal, if necessary.

Distance from Cape Town to Bombay, by (a), above, starting on route 340 (a), 4,600 miles; starting on 340 (b), 4,875 miles; by (b), above, 4,695 miles.

Route 342. Cape Town to Mauritius

Proceed as in Route 341 (b) above to the position south-east of Madagascar in lat. 26° 50′ S., long. 47° 40′ E., and thence steer direct to Mauritius.

Distance from Cape Town to Mauritius, 2,335 miles.

Route 343. Cape Town to Colombo, Madras, Calcutta or Rangoon

(a) West of Madagascar.—Proceed as in Route 340 (a) or (b) to the position off Ile Juan de Nova in lat. 17° 00′ S., long. 42° 15′ E., and thence:—

(i) April to October.—Steer to pass 30 miles eastward of Geyser reef and Ile Glorieuses (Glorioso island) and 30 miles westward of Providence island, paying due attention to the west-going current running strongly past Cap d'Ambre (north point of Madagascar).

From the position off Providence island, take a Rhumb line track to a position in lat. 1° 20′ N., long. 73° 15′ E., in the One-and-a-half-degree channel in the Southern Maldive islands, and from thence direct to Colombo; or if for Bay of Bengal ports, directly round the S.E. of Ceylon to destination.

(ii) July to February.—From Ile Juan de Nova, steer as in Route 341 to the position off Aldabra island; and from thence on a slightly curving course to pass 50 miles northward of the Seychelles islands, and through lat. 1° 10′ S., long. 61° 30′ E., to One-and-a-half degree channel in the Southern Maldive islands. From this point continue as in 343 (a) (i), above.

(b) East of Madagascar.—If calling at Durban, take the inner route around the coast (between 1 and 6 miles from it) and from thence steer on a Rhumb line to lat. 26° 50′ S., long. 47° 40′ E. If not calling at Durban, proceed as in Route 341 (b) to the same position. Thence:—

(i) May to September.—If not requiring to call at Mauritius for fuel or other reason, steer to pass 60 miles southward of the island, and thence to pass 30 miles eastward of Diego Garcia island. From Diego Garcia, the routes are on Rhumb lines, as directly as navigation permits, to all destinations.

(ii) November to March.—From the position off the S.E. point of Madagascar (*Lat. 26° 50′ S., Long. 47° 40′ E.*), steer first on a Rhumb line course to lat. 17° 00′ S., long. 56° 00′ E. and then to lat. 8° 00′ S., long. 68° 00′ E. Thence pass 100 miles westward of the Chagos archipelago, and 60 miles southward of the Maldive islands, from which point steer a direct course to destination.

Distances from Cape Town using 340 (a) in (a) (i) and (ii) are:—

To Calcutta: By (a) (i), 5,588 miles; by (a) (ii), *see* note; by (b) (i), 5,540 miles; by (b) (ii), 5,470 miles.

To Colombo: By (a) (i), 4,434 miles; by (a) (ii), *see* note; by (b) (i), 4,440 miles; by (b) (ii), 4,362 miles.

To Madras: By (a) (i), 4,935 miles; by (a) (ii), *see* note; by (b) (i), 4,845 miles; by (b) (ii), 4,825 miles.

To Rangoon: By (a) (i), 5,593 miles; by (a) (ii), *see* note; by (b) (i), 5,490 miles; by (b) (ii), 5,470 miles.

Note.—The distances by (a) (ii) are about 100 miles more than by (a) (i).

Route 344. Cape Town to Singapore or China sea

(a) Via Soenda (Sunda) straat.—All seasons.

(i) Main Route.—Steer southward, until clear of west-going current, to a position lat. 36° 45′ S., long. 19° 00′ E., and thence to a position lat. 33° 45′ S., long. 36° 30′ E. From this point steer on the Great Circle track to Soenda straat, crossing long. 60° 00′ E. at lat. 29° 00′ S., and long. 90° 00′ E. at lat. 15° 50′ S., and passing close north of the Cocos islands, and thence to lat. 6° 25′ S., long. 105° 00′ E., in Soenda straat.

(ii) Alternative Route.—The following route is recommended by some navigators; but is about 100 miles greater in distance. From Cape Town, follow the coast inside the Agulhas current to Algoa bay; thence steer to cross the parallel of 30° S., in long. 54° E., and the meridian of 80° E. in lat. 19½° S. Thence proceed northward of the Keeling islands, to lat. 6° 25′ S., long. 105° 00′ E., in Soenda straat.

For description of the route onward to Singapore and the China sea, *see* remarks at the end of Route 310 (b) (v). *See also* Eastern Archipelago Pilot, Vol. IV.

(b) Via Malacca strait.—All seasons.—Take Route 342 to Mauritius, and thence proceed on a direct Rhumb line track to lat. 5° 49′ N., long. 95° 00′ E., to the west of Bengal passage. Thence proceed as

in Route 310 (a) to Penang or Singapore. *See* Malacca Strait Pilot, and Notes at the end of Route 310.

See Chapter 11. of Section C., Part II. for details of many of the channels through the Eastern archipelago.

Distances from Cape Town to Singapore by (a) (i), 5,650 miles; by (b), 5,629 miles; to Penang, by (b). 5,334 miles.

The distance to Soenda straat *(Lat. 6° 25′ S., Long. 105° 00′ E.)* by (a) (i), is 5,065 miles.

For routes onward from Singapore to the China sea and Pacific ocean, *see* Section B, Part IV., Chapter III.

Route 345. Cape Town to North Australian ports

(a) Summer months.—First proceed as in Route 346 to lat. 36° 45′ S., long. 19° 00′ E., and thence by Rhumb line to lat. 39° 25′ S., long. 50° 00′ E.; thence take a Great Circle track to lat. 15° 30′ S., long. 120° 00′ E. From this point proceed as directly as navigation permits to Port Darwin or Thursday island.

If bound to Broome or King Sound, leave the Great Circle on reaching long. 115° 00′ E. in about lat. 19° 00′ S., and proceed thence as directly as navigation permits to destination.

Note.—If desired, the Rhumb line may be left at lat. 39° 00′ S., long. 45° 00′ E., and a Great Circle taken to lat. 11° 30′ S., long. 118° 00′ E., when bound to Port Darwin or Thursday island. This may avoid running into a Willy-willy (November to April) off the north or north-west coast of Australia, until well into the Arafura sea. The distances are increased by about 100 miles.

(b) Winter months. See Route 346 (b).—First get on to and then follow the parallel of 35° 30′ S., as far as long. 79° 15′ E. and there join (a) above. The distance is about 45 to 50 miles less than in (a), but much more of the Agulhas current is likely to be felt.

Distance from Cape Town by (a) to Broome, 5,617 miles; to Cape Leveque (King sound entrance), 5,677 miles; to Port Darwin, 6,239 miles; to Thursday island, 6,933 miles.

The distance from Cape Town to lat. 15° 30′ S., long. 120° 00′ E. is 5,551 miles; to lat. 19° 00′ S., long. 115° 30′ E. it is 5,196 miles; to lat. 11° 30′ S., long. 118° 00′ E. it is 5,604 miles.

Route 346. Cape Town to Fremantle

(a) Summer months.—Steer first for lat. 36° 45′ S., long. 19° 00′ E., to clear the west-going current, and thence on a Rhumb line to lat. 40° 00′ S., long. 55° 00′ E. Steer thence along the parallel of 40° 00′ S. to long. 77° 00′ E., and thence take the Great Circle track direct to Fremantle, crossing:

long.	90° 00′ E.	at lat.	38° 50′ S.
,,	100° 00′ E.	,,	37° 00′ S.
,,	110° 00′ E.	,,	34° 10′ S.

(b) Winter months.—During the winter months, it is not advisable to go much further south than about lat. 35° 30′ S. The heavy weather usually encountered to the southward causes not only great discomfort, but even risk, especially in the case of a merchant vessel in light trim, with a racing propeller in the heavy following seas.

First proceed to lat. 35° 30′ S., long. 20° 00′ E., southward of Cape Agulhas, and thence steer along the parallel of lat. 35° 30′ S. to long. 90° 00′ E. Thence take a Great Circle or Rhumb line track to Fremantle.

Distance from Cape Town to Fremantle, by (a), summer, 4,808 miles; by (b), winter, 4,853 miles.

See note on Icebergs under Route 350.

Route 347. Cape Town to Adelaide

(a) Summer months.—Take Route 346 (a) to lat. 40° 00′ S., long. 77° 00′ E., and then continue along the parallel of lat. 40° 00′ S. to long. 100° 00′ E. Thence take the Great Circle track direct to Adelaide, crossing

long.	110° 00′ E.	at lat.	39° 45′S .
,,	120° 00′ E.	,,	39° 00′ S.
,,	130° 00′ E.	,,	37° 15′ S.

(b) Winter months.—*See* first par. of Route 346 (b). —First proceed as in Route 346 (b) to lat. 35° 30′ S., long. 20° 00′ E., and thence continue along the parallel of lat. 35° 30′ S. to Investigator strait and thence to Adelaide.

Distance from Cape Town to Adelaide by (a), Summer months, 5,786 miles; by (b), Winter months, 5,943 miles.

See note on Icebergs under Route 350.

Route 348. Cape Town to Melbourne

(a) Summer months.—(i) General route.—Take Routes 346 (a) and 347 (a) to lat. 40° 00′ S., long. 100° 00′ E., and Great Circle track thence to Melbourne, crossing

long.	110° 00′ E.	at lat.	41° 20′ S.
,,	120° 00′ E.	,,	41° 40′ S.
,,	130° 00′ E.	,,	41° 00′ S.
,,	140° 00′ E.	,,	39° 45′ S.

(ii) Alternative route.—Follow Route 349 (a) (ii), as far as lat. 45° 00′ S., long. 120° 00′ E., and thence take a Great Circle track to Cape Otway for Melbourne. This route is some 200 miles shorter than that given in (a) (i) above, but the weather is likely to be more boisterous.

(b) Winter months.—*See* first par. of Route 346 (b). —First proceed as in Route 346 (b) to lat. 35° 30′ S., long. 20° 00′ E., and thence continue along the parallel of lat. 35° 30′ S. to long. 115° 08′ E., about 68 miles south of Cape Leeuwin. Thence take a Great Circle track to Cape Otway, and thence to Melbourne.

Distances from Cape Town to Melbourne (Port), by (a), Summer, (i) 6,051 miles; (ii), 5,850 miles; by (b), Winter, 6,257 miles.

The distance from Cape Town to the position south of Cape Leeuwin is 4,792 miles.

See note on Icebergs under Route 350.

Route 349. Cape Town to Hobart

(a) Summer months.—(i) General route.—Take Routes 346 (a), 347 (a) and 348 (a) (i) to a point on the Great Circle portion of the last-named route in lat. 41° 30′ S., long. 122° 50′ E., and from this point take a second Great Circle track to round the southern extreme of Tasmania, whence steer as directly as possible to Hobart.

This second Great Circle track crosses long. 130° 00′ E. at lat. 42° 40′ S. and long. 140° 00′ E. at lat. 44° 00′ S.

(ii) Alternative route.—From Cape Town steer first for lat. 36° 45′ S., long. 19° 00′ E., thence make a Rhumb line track for lat. 44° 00′ S., long. 40° 00′ E. Thence, again on a Rhumb line, for lat. 45° 00′ S., long. 65° 00′ E. From this point, steer along the 45° 00′ parallel to long. 130° 00′ E., and from thence direct to Hobart as navigation permits.

(b) Winter months.—*See* first par. of Route 346 (b). —Proceed as in Route 348 (b) to a point in lat. 35° 30′ S., long. 115° 08′ E., and thence take a Great Circle track to a position in lat. 43° 42′ S., long. 145° 53′ E., about 10 miles south-westward of South West Cape, Tasmania; and thence proceed to Hobart as directly as navigation permits. *See* Australia Pilot, Vol. II.

Distance from Cape Town to Hobart by (a), Summer (i), 6,119 miles; (ii), 5,846 miles; by (b), Winter, 6,379 miles.

See note on Icebergs under Route 350.

Route 350. Cape Town to New Zealand, South American ports and Cabo de Hornos (East-about)

Note.—For west-about route from Cape Town *see* Part I, Chapter II. across the Atlantic and Part IV., Chapter IV. westwards across the Pacific.

(a) Summer months.—(i) Follow Route 349 (a) (i), to the position lat. 41° 30′ S., long. 122° 50′ E., and thence take a Great Circle track to a point in lat. 47° 50′ S., long. 167° 50′ E., east-north-eastward of The Snares. From this point steer as directly as navigation permits to New Zealand ports.

For the route onward across the Pacific *see* Part IV., Chapter II.

(ii) Follow Route 349 (a) (ii) to the position in lat. 45° 00′ S., long. 130° 00′ E. and from thence take the Great Circle track to lat. 47° 50′ S., long. 167° 50′ E., and thence as in (a) above.

(b) Winter route.—*See* first par. of Route 346 (b).—Proceed as in Route 349 (b) above to lat. 43° 42′ S., long. 145° 53′ E., off S.W. Cape, Tasmania, and thence take a Great Circle track to a point in lat. 47° 50′ S., long. 167° 50′ E., east-north-eastward of The Snares.

Distance from Cape Town to the position east-north-east of The Snares:—By (a) (i), 6,925 miles; by (a) (ii), 6,624 miles; by (b), 7,215 miles.

Icebergs.—In addition to the severe weather to be expected in high latitudes, icebergs, often of very large size, may be met at all seasons of the year. They are, however, rarely met north of lat. 40° S., but there are records of icebergs being seen off the Cape of Good Hope, and northward of lat. 40° S., when eastward of long. 60° E.

Between 40° and 45° S. lat., icebergs have been occasionally met with eastward of 65° E., on the 45th parallel, to 135° E., and on the 50th parallel, to 140° E.

In July, 1895, thirteen icebergs were passed between lat. 44½° S., long. 44° E., and lat. 45½° S., long. 67° E.; and in the same month the s.s. "Port Chalmers" collided with an iceberg in lat. 44° 55′ S., long. 52° 23′ E.

See remarks on Ice on page 88.

Route 351.—*Reserved as spare.*

(v) ROUTES FROM MAURITIUS

Distances given are from Port Louis

Route 352. Mauritius to Durban or Cape Town

(1) To Durban.—Steer first on a Rhumb line for a position in lat. 26° 50′ S., long. 47° 40′ E., 100 miles to the S.E. of Madagascar, and from thence direct to Durban.

(2) To Cape Town.—Steer, as in (1), above, to the position S.E. of Madagascar, and from thence on a Rhumb line track to a position about 50 miles from the coast off Algoa bay, and thence as direct as navigation permits, keeping in the Agulhas Current, to destination.

Distance from Mauritius to Cape Town, 2,335 miles; to Durban, 1,590 miles.

By calling at Durban, and proceeding thence to Cape Town, the distance is increased by 56 miles, namely, 2,391 miles.

Note.—If not intending to call at Cape Town, but proceeding onward into Atlantic ocean, keep at about 100 miles from the South African coast, but still in the west-going stream. *See* Part I., Chapter II.

Route 353. Mauritius to Zanzibar or Mombasa

Proceed as direct as navigation permits.

Distance from Mauritius to Zanzibar, 1,382 miles; to Mombasa, 1,424 miles.

Route 354. Mauritius to Seychelles

Generally proceed as direct as navigation permits, but from November to March low-powered vessels should keep rather westward of the direct route until in the North-West Monsoon, and then proceed as direct as possible.

Distance from Mauritius to Seychelles, 946 miles.

Route 355. Mauritius to Aden

(a) Usual route.—Full-powered vessels.—All seasons.—Proceed as directly as navigation permits to Capo Guardafui, passing east or west of Seychelles as may be most advantageous in the prevailing weather conditions; thence steer direct to Aden.

(b) Alternative routes.—Low-powered vessels.—

(i) October to March.—Run northward through the South-East Trade and North-West Monsoon to cross the Equator in about long. 61° 00′ E. Thence make northing into the North-East Monsoon, and, when able, steer direct for the Gulf of Aden, passing north of Socotra if possible, giving it a berth of at least 40 to 60 miles.

(ii) April to September.—Steer to pass westward of the Amirante islands, and thence direct to Capo Guardafui. Proceed thence along the African coast as far as Mait island before standing across for Aden.

Distance from Mauritius to Aden, by (a), 2,336 miles.

For continuation into the Red sea *see* Route 302.

Route 356. Mauritius to Bombay

Steer to pass westward of Cargados Carajos, and thence as direct as navigation permits to Bombay. *See* Cautions in Route 307 (a) and (b).

Distance from Mauritius to Bombay, 2,518 miles.

Route 357. Mauritius to Colombo and ports in the Bay of Bengal

Steer to the north-eastward to join Route 343 (b) (i).

Distances from Mauritius are:—

To Calcutta, 3,217 miles; to Colombo, 2,099 miles; to Diego Garcia, 1,173 miles; to Madras, 2,563 miles; to Rangoon, 3,210 miles.

Route 358. Mauritius to Malacca strait and Singapore

Follow Route 344 (b).

Distance from Mauritius to Penang, 3,033 miles; to Singapore, 3,324 miles.

For routes onward to the Pacific *see* Part IV., Chapter III.

Route 359. Mauritius to Thursday island

Follow a Rhumb line track to a position in lat. 15° 30′ S., long. 120° 00′ E., and thence as direct as navigation permits to destination. Alternatively proceed to one of the positions off the Eastern archipelago mentioned in Route 311 and proceed as in that route.

Distance Mauritius to Thursday island, 4,940 miles.

For routes onward to ports in the Pacific, *see* Part IV., Chapter II.

Route 360. Mauritius to Fremantle, Adelaide, or Melbourne

In each case take the Great Circle track direct to destination or to the approaches thereto.

Distance from Mauritius to Adelaide, 4,289 miles; to Fremantle, 3,199 miles; to Melbourne (Port). 4,587 miles.

Route 361.—*Reserved as spare.*

(vi) ROUTES FROM SEYCHELLES

Distances are given from Mahé.

Route 362. Seychelles to Durban or Cape Town

Steer as direct as navigation permits to join Route 389, Bombay to Durban or Cape Town east of Ile Mayotte, Iles Comores.

Distance from Seychelles to Durban, 2,077 miles; to Cape Town, 2,865 miles.

For Routes onward from Cape Town to the ports in the Atlantic ocean, *see* Part I., Chapter II.

Route 363. Seychelles to Mauritius

(a) Usual route.—Full-powered vessels.—Proceed as direct as navigation permits.

(b) Alternative routes.—Low-powered vessels.

(i) November to March.—Steer to pass north and east of Saya de Malha bank, and then southward into the South-East Trade. Thence proceed direct to Mauritius.

(ii) April to October.—Stand eastward to about long. 70° E., and then proceed southward until well into the South-East Trade; thence proceed direct to Mauritius.

Distance from Seychelles to Mauritius: By (a), 946 miles.

Route 364. Seychelles to Zanzibar or Mombasa

(a) Usual route.—Full-powered vessels.—Proceed as direct as navigation permits.

(b) Alternative routes.—Low-powered vessels.

(i) October to April.—Proceed as in (a).

(ii) April to October.—Proceed direct, but allowance should be made for the probability of the wind heading, and for the strong northerly current to be entered on nearing the African coast.

Distance from Seychelles to Zanzibar, 1,382 miles; to Mombasa, 1,424 miles.

Route 365. Seychelles to Aden

(a) Usual route.—Full-powered vessels.—Proceed direct round Capo Guardafui, but during the South-West Monsoon Ras Hafun should be made before Capo Guardafui.

(b) Alternative routes.—Low-powered vessels.

(i) November to March.—First steer to the north-eastward to cross the Equator in about long. 61° 00′ E., and thence proceed northward into the North-East Monsoon; when able to weather Socotra, stand for the Gulf of Aden, giving the former a berth of at least 40 miles.

(ii) April to October.—First steer direct for Ras Hafun and, after rounding Capo Guardafui, proceed along the African coast until abreast Mait island; then stand across to Aden.

Distance from Seychelles to Aden by (a), 1,400 miles.

For routes onward from Aden into the Red sea *see* Route 302.

Route 366. Seychelles to Bombay

Proceed as direct as navigation permits.

Distance from Seychelles to Bombay, 1,752 miles.

Route 367. Seychelles to Colombo

(a) Usual route.—Full-powered vessels.—Steer to pass through the One-and-a-half degree channel, and thence direct to Colombo.

(b) Alternative routes.—Low-powered vessels.

(i) November to March.—Proceed on a Rhumb line to a position in lat. 4° 00′ S., long. 73° 00′ E., north of Chagos archipelago, and thence steer to cross the Equator in long. 80° E.; from thence make for the south-west end of Ceylon, and continue up the coast to Colombo.

(ii) April to October.—Steer direct to pass through the Eight Degree channel, or, alternatively, to pass through the more direct route offered by the Kardiva channel (but not at night unless the entrance has been made before dark). In either case proceed thence direct to Colombo.

Distance from Seychelles to Colombo by (a), 1,644 miles.

Route 368. Seychelles to Fremantle or South Australian ports

First proceed as direct as navigation permits to a position in lat. 11° 30′ S., long. 60° 00′ E., and thence take a Great Circle track to Fremantle or, if bound to South Australian ports, to a position in lat. 34° 32′ S., long. 115° 08′ E., about 10 miles south of Cape Leeuwin; from the latter proceed as in Route 313 to destination.

Distance from Seychelles: To Fremantle, 3,752 miles; to C. Leeuwin, 3,757 miles.

Route 369.—*Reserved as spare.*

See Section D. Part II. Index on pages 349 and 350.

SECTION B. PART III

Chapter IV

ROUTES FROM PORTS IN THE PERSIAN GULF, AND ON THE NORTHERN SIDE OF THE INDIAN OCEAN

(i) ROUTES FROM PERSIAN GULF

For Routes through Persian gulf both ways *see* Persian Gulf Pilot.

CAUTION. In the Persian gulf, during a shamāl in summer, or while the nashi is blowing in the southern part of the Gulf in winter, the haze may obscure the land so completely that the surf on the beach may be the first intimation of its proximity.

Tropical storms, known as " Cyclones," occur in the Arabian sea, being most frequent at the season of the change of monsoon. Details of these storms will be found in Chapter I. of the West Coast of India Pilot.

Route 370. Persian gulf to Aden

After passing Muscat, keep as close to the Arabian coast as navigation permits. This is especially advisable during the South-West Monsoon, when the full force of the wind, and of the north-east set, will be felt only in the vicinity of the Kuria Muria islands, and off Ras al Kalb.

CAUTION. *See* Red Sea and Gulf of Aden Pilot respecting currents off Aden and off the Gulf of Masira.

Distances to Aden *from:—*

Bahrein, 1,732 miles; Bushire, 1,792 miles; Fao, 1,909 miles; Jāsk, 1,328 miles; Muscat, 1,203 miles.

Route 371. Persian gulf to Mombasa, Durban or Cape Town

(a) During the South-West Monsoon.—Take the reverse of Route 322 (to Mombasa), and thence by Route 327 to destination.

In June, 1931, the s.s. British Dominion, bound from the Persian gulf to the Cape of Good Hope, after rounding Ras al Hadd, steered southward on the 60th meridian, with the object of crossing the South-West Monsoon area as soon as possible, and, consequently, of meeting with less adverse current. On reaching lat. 6° 30′ N. course was altered direct for Iles Comores. This route, though about 150 miles longer than Routes 322 and 327 mentioned above, was found to be advantageous.

(b) During the North-East Monsoon.—If not calling at Mombasa, proceed direct from Ras al Hadd on Rhumb line tracks passing through lat. 13° 10′ N., long. 54° 50′ E., eastward of Socotra island; thence through lat. 11° 35′ S., long. 42° 50′ E., westward of Iles Comores; and thence as in Route 327 to destination.

Distance from Persian gulf (Fao) to Mombasa by (a), 2,820 miles; to Durban, by (a) (calling at Mombasa), 4,591; by (b), 4,371 miles; to Cape Town, by (a) (calling at Mombasa), 5,381 miles; by (b), 5,161 miles.

For Routes onward from Cape Town into the Atlantic ocean, *see* Section B, Part I., Chapter II.

Route 372. Persian gulf to Karāchi or Bombay

All seasons.—Proceed as directly as navigation permits to either destination.

Distance from Persian gulf (Fao) to Bombay, 1,524 miles; to Karāchi, 1,091 miles; to Muscat, 709 miles.

From Muscat to Karāchi, 467 miles; to Bombay, 853 miles.

Route 373. Persian gulf to Colombo

All seasons.—After passing Jāsk, steer on a Rhumb line to a point off the Malabar coast in lat. 12° 00′ N., long. 74° 40′ E., and thence, as directly as navigation permits, to destination.

Distance from Persian gulf (Fao), to Jāsk, 594 miles; to Colombo, 2,291 miles. From Jāsk to Colombo, 1,709 miles; from Muscat to Colombo, 1,596 miles.

Route 374. Persian gulf to ports in Bay of Bengal or Malacca strait

Proceed as in Route 373 as far as lat. 12° 00′ N., long. 74° 40′ E., and thence steer as directly as navigation permits to join Route 402, Colombo to Bay of Bengal or Malacca strait, off Point de Galle, Ceylon, in lat. 6° 00′ N., long. 80° 00′ E.

Distances from Persian gulf (Fao) are: To Calcutta, 3,514 miles; to Madras, 2,860 miles; to Penang, 3,546 miles; to Point de Galle, 2,331 miles; to Rangoon, 3,519 miles; to Singapore, 3,837 miles.

For routes onward from Singapore to ports in the Pacific, *see* Section B., Part IV., Chapter III.

Route 375. Persian gulf to Port Darwin or Thursday island

Proceed as in Route 374 above to the position off Point de Galle and join Route 403, Colombo to Soenda straat and North Australian ports.

Distance from Persian gulf (Fao) to Port Darwin and Thursday island are 2,270 miles longer than those given in Routes 403 from Colombo.

For routes onward from Thursday island to ports in the Pacific, *see* Section B., Part IV., Chapter II.

Route 376. Persian gulf to Fremantle

Proceed as in Route 374 to Point de Galle, and join Route 404, Colombo to Fremantle.

Distance from Persian gulf (Fao) to Fremantle, 5,383 miles.

Route 377. Persian gulf to Cape Leeuwin and South Australian ports

Proceed as in Route 374 to Point de Galle and join Route 405, Colombo to Cape Leeuwin; thence proceed as in Route 313 to destination.

Distances from Persian gulf (Fao) to Cape Leeuwin, 5,452 miles; to Adelaide, 6,617 miles; to Hobart, 7,077 miles; to Melbourne, 6,952 miles; to Sydney, 7,412 miles.

Route 378.—*Reserved as spare.*

See Section D. Part II. Index on pages 349 and 350.

(ii) ROUTES FROM KARĀCHI

See Cautions regarding haze and " Cyclones " at the beginning of sub-section (i), Routes from Persian gulf. *See also* note regarding navigation between Bombay and Karāchi at the end of Route 392, Bombay to Karāchi, Muscat and Persian gulf.

Route 379. Karāchi to Mauritius

(a) Usual route.—Normally proceed as directly as navigation permits, but in the strength of the South-West Monsoon it is advisable to keep along the coast to the southward at a safe distance (*see* note at the end of Route 392) until reaching the meridian of 70° 00′ E. Thence steer due south to the Equator, and thence to Mauritius direct, passing east of Cargados Carajos. The increase in distance is about 245 miles.

(b) Low-powered vessels in the height of the South-West Monsoon, should make to the south-eastward to pass north and east of the Lacadive islands; thence they should steer southward, passing east of the Maldive islands and the Chagos archipelago, to a position in about lat. 7° 30′ S., long. 72° 35′ E., south-eastward of Diego Garcia; and thence direct to Mauritius.

Distance from Karāchi to Mauritius, by (a), 2,755 miles; by (b), Low-powered vessels, 3,203 miles.

Route 380. Karāchi to Durban or Cape Town

(a) May to September.—Take a course parallel to the coast until reaching the meridian of 70° 00′ E. (*see* note at the end of Route 392), and thence steer due south to join Route 389 (a), Bombay to Cape Town, in about lat. 15° 40′ N., long. 70° 00′ E.

(b) Low-powered vessels when the full South-West Monsoon is blowing, at first proceed as above, but continue southward on the meridian of 70° 00′ E., to join Route 389 (b), Bombay to Cape Town in about lat. 12° 50′ N., long. 70° 00′ E.

(c) October to April.—Follow a Rhumb line track direct to a position about 20 miles eastward of Astove island (*Lat. 10° 06′ S., Long. 47° 45′ E.*), to join Route 389 (a), Bombay to Cape Town.

Distances from Karāchi are:—

To Durban, by (a), 4,188 miles; by (b), 4,284 miles; by (c), 3,900 miles.

To Cape Town, by (a), 4,979 miles; by (b), 5,075 miles; by (c), 4,690 miles.

For routes onward from Cape Town to ports in Atlantic ocean, *see* Section B., Part I., Chapter II.

Route 381. Karāchi to Mombasa

(a) May to September.—Proceed as in Route 380 (a) above, to join Route 390 (a), Bombay to Mombasa, in lat. 17° 06′ N., long. 70° 00′ E.

(b) Low-powered vessels when the full South-West Monsoon is blowing, follow Route 380 (b) above along the meridian of 70° 00′ E., to a position in lat. 12° 50′ N., long. 70° 00′ E., to join Route 390 (b), Bombay to Mombasa.

(c) October to April.—Proceed on a Rhumb line track direct to Mombasa.

Distance from Karāchi to Mombasa, by (a), 2,754 miles; by (b), 2,905 miles; by (c), 2,359 miles.

Route 382. Karāchi to Aden

Proceed direct to a position off the Kuria Muria islands and thence to Aden as directly as navigation will permit, keeping about 20 or 30 miles outside the headlands of the Arabian coast.

Distance from Karāchi to Aden, 1,470 miles.

Note.—Low-powered vessels, unable to face the full strength of the South-West Monsoon, may proceed as in Route 380 (a) to join Route 391 (b), Bombay to Aden, in lat. 12° 50′ N., 70° 00′ E. The distance (2,739 miles) by this route, however, is nearly doubled, but the heavy head wind and sea is largely avoided.

Route 383. Karāchi to Muscat or Persian gulf

Proceed in both cases as direct as navigation permits. *See* Persian Gulf Pilot for passages up the Gulf.

Distances from Karāchi are:—

To Bahrein, 914 miles; to Fao, 1,091 miles; to Jāsk, 509 miles; to Muscat, 467 miles.

Route 384. Karāchi to Bombay

Proceed as direct as navigation will permit. *See* note at the end of Route 392, Bombay to Karachi.

Distance from Karāchi to Bombay, 500 miles.

Route 385. Karāchi to Colombo

Proceed as direct as navigation permits. *See* note at the end of Route 392, Bombay to Karāchi.

Distance from Karāchi to Colombo, 1,341 miles.

Route 386. Karāchi to Bay of Bengal, Malacca strait, Soenda straat and North, West and South Australian ports

Proceed as direct as navigation permits to a position in lat. 6° 00′ N., long. 80° 00′ E., off Point de Galle to join one of the following routes:—

(1) To BAY OF BENGAL.—Route 402, Colombo to ports in Bay of Bengal or Malacca strait.

(2) To MALACCA STRAIT.—As above.

(3) To NORTH AUSTRALIA.—Route 403, Colombo to Port Darwin or Thursday island.

(4) To SOENDA STRAAT.—As for (3).

(5) To WEST AUSTRALIA.—Route 404, Colombo to Fremantle.

(6) To SOUTH AUSTRALIA.—Route 405, Colombo to Cape Leeuwin and to ports in Southern Australia.

The distance from Karāchi is in each case, 1,322 miles more than that given in the Routes mentioned in (1) to (6) above.

Route 387.—*Reserved as spare.*

(iii) ROUTES FROM BOMBAY

Route 388. Bombay to Mauritius

All seasons.—Follow Rhumb line tracks, crossing the Equator in about long. 66° 45′ E.; thence pass eastward of Nazareth bank and Cargados Carajos and thence proceed direct to Mauritius.

Note.—In the strength of the South-West Monsoon, a vessel may benefit by steering due south on reaching the meridian of 70° E., and from the Equator proceed as before.

Distance from Bombay to Mauritius, 2,518 miles.

Route 389. Bombay to Seychelles, Durban or Cape Town

(a) Main route.—Follow a Rhumb line track at all seasons towards the south-east point of Ile Mayotte (Iles Comores), so as to pass it at about 20 miles distance. This track passes at about 20 miles eastward of Astove island (*Lat. 10° 06′ S., Long. 47° 45′ E.*); attention is called to the strong westerly set of the equatorial current of this region.

From the position off Ile Mayotte, steer so as to pick up the southward track through the Moçambique channel at lat. 17° 00′ S., long. 40° 00′ E., and thence as in Route 319 (a), to destination.

(b) Low-powered vessels during full South-West Monsoon, should steer first for lat. 6° 00′ N., long. 67° 00′ E., and thence direct to pick up the track given in (a), above, at lat. 3° 00′ S., long. 54° 00′ E., and

thence as above to destination. This increases the distances by (a) above by 70 miles.

Note.—Vessels bound to the Seychelles group should leave (a) or (b) above soon after crossing the Equator and proceed direct to destination.

Distance from Bombay by (a) to Cape Town, 4,600 miles; to Durban, 3,809 miles; to Mahé (Seychelles), 1,752 miles.

For Routes onward from Cape Town into the Atlantic, *see* Section B., Part I., Chapter II.

Route 390. Bombay to Mombasa and Zanzibar

(a) Main route.—All seasons.—Take a Rhumb line direct.

(b) Low-powered vessels.—During the full South-West Monsoon, low-powered vessels should steer first for a position in lat. 6° 00′ N., long. 67° 00′ E., and thence proceed direct to destination. The increase in distance over that in (a), above, is 155 miles.

Distance from Bombay, by (a), to Mombasa, 2,400 miles; to Zanzibar, 2,517 miles.

Route 391. Bombay to Aden

(a) May to September.—Full-powered vessels.—Follow the Great Circle track, crossing long. 70° 00′ E. at lat. 19° 00′ N.; long. 65° 00′ E. at 18° 30′ N.; and long. 60° 00′ E. at lat. 17° 30′ N.

In June, July and August, when the South-West Monsoon is unusually heavy, vessels should keep on the parallel of Bombay until about 100 miles from the Arabian coast, and then pass about 20 or 30 miles outside the headlands. The sea and wind are at their height between the meridians of 66° and 60° E.; farther westward, both wind and sea begin to abate. The distance is only increased by 35 miles.

The adverse current experienced on this passage averages one knot; eastward of the meridian of 60° E., it is from one-half to three-quarters of a knot; and westward of 60° E., from one to one and a half knots.

(b) May to September.—Low-powered vessels.—When the full South-West Monsoon is blowing, a low-powered vessel should steer first for lat. 6° 00′ N., long. 67° 00′ E.; thence along the parallel of 6° 00′ N. to long. 60° 00′ E., thence to lat. 8° 00′ N., long. 52° 40′ E., and thence round Capo Guardafui to Aden.

The distance is 890 miles longer than (a), above, but the heavy head wind and sea of the South-West Monsoon will be altogether avoided; and much Wear and tear, and a heavy fuel expenditure will be saved. *See* Caution under Route 399 (c).

(c) October to April.—All vessels.—Follow the Rhumb line track direct, crossing long. 60° 00′ E., in lat. 16° 00′ N.

CAUTION. At all times of the year when making Aden, a strong on-shore set of current is frequently experienced.

Distance from Bombay to Aden by (a), 1,645 miles; by (b), 2,334 miles; by (c), 1,657 miles.

Route 392. Bombay to Karāchi, Muscat and Persian gulf

Proceed as direct as navigation permits in all seasons.

Notes.—Bombay to Karāchi.—During the South-West Monsoon, sounding is strongly recommended. A wide berth should be given to the coast, the prevailing monsoon-sea and swell invariably setting a vessel towards the shore.

An easterly set is reported as being felt, at all seasons, on the Kori Great Bank, to the southward of the Swatch (the remarkable neck of deep soundings in the bank). Sounding should be resorted to until the Swatch is passed. A course should then be steered for a position midway between Cape Monze, westward of Karāchi harbour, and Manora point, off the harbour entrance, until land is sighted.

Distances from Bombay are:—

To Bahrein, 1,347 miles; to Bushire, 1,407 miles; to Fao, 1,524 miles; to Jāsk, 942 miles; to Karāchi, 500 miles; to Muscat, 853 miles.

Route 393. Bombay to Colombo

Proceed as direct as navigation permits, in all seasons.

Distance from Bombay to Colombo, 889 miles.

Route 394. Bombay to Bay of Bengal, Malacca strait, Soenda straat and North, West and South Australian ports

Proceed as direct as navigation permits to a position in lat. 6° 00′ N., long. 80° 00′ E., off Point de Galle, to join one of the following routes.

(1) To BAY OF BENGAL.—Route 402, Colombo to ports in Bay of Bengal.

(2) To MALACCA STRAIT.—Route as above.

(3) To NORTH AUSTRALIA.—Route 403, Colombo to Soenda straat and North Australian ports.

(4) To SOENDA STRAAT.—Route as for (3).

(5) To WEST AUSTRALIA.—Route 404, Colombo to Fremantle.

(6) To SOUTH AUSTRALIA.—Route 405, Colombo to Cape Leeuwin and to ports in Southern Australia.

The distance from Bombay is, in each case, 870 miles more than that given in the routes mentioned in (1) to (6) above.

Route 395.—*Reserved as spare.*

(iv) ROUTES FROM COLOMBO

Route 396. Colombo to Mauritius

Steer direct to a position south-eastward of Diego Garcia, in lat, 7° 30′ S., long. 72° 35′ E., and thence direct to Mauritius.

Distance from Colombo to Mauritius, 2,100 miles; to Diego Garcia, 971 miles.

Route 397. Colombo to Durban or Cape Town

(a) West of Madagascar.

(i) All seasons.—Steer for the Eight Degree channel, and then as directly as possible to pick up Route 389 (a), at lat. 3° 00′ S., long. 54° 00′ E., and thence as directed in Route 389 (a).

(ii) Alternative route in April and October.—Steer for the One-and-a-half-degree channel in lat. 1° 15′ N′. long. 73° 20′ E., thence to lat. 8° 15′ S., long. 51° 45, E., and passing 30 miles west of Providence island, to lat. 17° 00′ S., long. 42° 15′ E.; from thence continue as directly as navigation permits to either destination.

Attention is called to the currents southward of lat. 5° S., especially when in the vicinity of Providence island, where they will probably be in a north-west direction, and near Geyser reef and Iles Glorieuse, where the set is usually strongly to the westward.

After leaving Ile Juan de Nova in lat. 17° 00′ S., a more favourable stream will be obtained closer to the African coast than the direct course to Cape Town.

(b) East of Madagascar.

(i) November to March.—Steer for the One-and-a-half-degree channel in the southern Maldive islands, and thence on a Rhumb line to lat. 15° 00′ S., long. 58° 00′ E. From this point steer for lat. 26° 50′ S., long. 47° 40′ E., and thence as directly as navigation permits to destination; but for latter part of the route to Cape Town, *see* Route 352, Mauritius to Cape Town.

See Section D. Part II. Index on pages 349 and 350.

(ii) May to September.—Steer towards Diego Garcia island, to a position off it in lat. 7° 30′ S., long. 72° 35′ E., and from thence, passing southward of Mauritius (or calling there for fuel if required), make for lat. 26° 50′ S., long. 47° 40′ E. Thence proceed as in (b) (i).

Distances from Colombo:—

To Durban: By (a) (i), 3,810 miles; by (a) (ii), 3,674 miles; by (b) (i), 3,675 miles; by (b) (ii), 3,710 miles.

To Cape Town: By (a) (i), 4,555 miles; by (a) (ii), 4,434 miles; by (b) (i), 4,415 miles; by (b) (ii), 4,440 miles.

For Routes onward from Cape Town to ports in the Atlantic ocean *see* Section B., Part I., Chapter II.

Route 398. Colombo to Seychelles or Mombasa

(a) October to April.—Full-powered vessels.—Steer for a position in the Eight Degree channel in lat. 7° 30′ N., long. 72° 45′ E., and thence on a direct Rhumb line to destination.

(b) Low-powered vessels.—Bound for Mombasa, proceed as in (a).

When bound for Seychelles, stand westward through the North-East Monsoon and cross the Equator in about long. 54° 00′ E.; from thence proceed direct to destination.

(c) May to September.—Full-powered vessels.—Steer to pass through the One-and-a-half-degree channel in lat. 1° 20′ N., long. 73° 20′ E., and thence direct to either destination.

(d) Low-powered vessels.—After getting a good offing steer southward across the Equator into South-East Trade, and thence to pass southward of the Chagos archipelago; thence proceed as direct as navigation permits to destination.

Distances from Colombo:—

To Seychelles: By (a), 1,694 miles; by (b), 1,930 miles; by (c), 1,644 miles; by (d), 2,054 miles.

To Mombasa: By (a), 2,518 miles; by (b), 2,518 miles; by (c), 2,558 miles; by (d), 2,994 miles.

Route 399. Colombo to Aden

(a) October to April.—Steer first for a position southward of Minicoy island (*Lat. 8° 16′ N., Long. 73° 01′ E.*); the lighthouse is on the South-west extreme of the island. From this point, take the direct Rhumb line track to round Capo Guardafui. When westward of Capo Guardafui, the African shore should be kept aboard as far as Mait island (*Lat. 11° 12′ N., Long. 47° 13′ E.*), in order to take advantage of the smooth water and favourable current. From thence, steer direct for Aden, observing that there is a dangerous local northerly current just eastward of that port, and along the Arabian shore, as far as the Straits of Bāb-al-Mandab.

(b) October to April (Alternative).—From the position off Minicoy island lighthouse take the Rhumb line track to lat. 13° 10′ N., long. 54° 50′ E., north-eastward of Socotra. and thence proceed direct to destination.

(c) May to September.—From Colombo, steer for lat. 7° 30′ N., long. 72° 45′ E., in the Eight Degree channel, and thence on a Rhumb line to lat. 8° 00′ N., long. 60° 00′ E. Thence proceed to lat. 8° 30′ N., long. 53° 00′ E., and thence, round Capo Guardafui to Aden.

CAUTION. *Rounding Capo Guardafui* (*Lat. 11° 50′ N., Long. 51° 17′ E.*).—Many wrecks have occurred on the coast southward of Capo Guardafui; the utmost caution is necessary when rounding this headland from the southward, or south-eastward during the South-West Monsoon, when the weather is stormy, with a heavy sea, and strong current, and the land generally obscured by thick haze.

The similarity of outline in the headlands of Ras Scenaghef (Jard Hafun or Shenarif) and Capo Guardafui is a fertile source of danger. Ras Scenaghef is, however, 2,900 feet high, and much the higher of the two, Capo Guardafui being only about 780 feet high, and separated from Ras Scenaghef by a broad sandy plain of little height compared with the two headlands that bound it.

In hazy weather at night, the steep fall of Ras Scenaghef may dimly be seen from the deck of a vessel; when this bears less than 270°, if Capo Guardafui is not sighted, as is often the case from the haze being thickest in the lower strata, and also from the light colour of the hill making it difficult to discern, the navigator, mistaking Ras Scenaghef for Capo Guardafui, fancies he is rounding the latter, steers westward into the low bay of Wadi Tòhen (Tuhom), and discovers his error too late for remedy.

During daytime, a gradual change from blue to dark green will probably be observed in the colour of the water; it also becomes smoother, and the swell alters its direction to eastward of south when the meridian of Ras Hafun has been passed. To ensure safety, however, when the land cannot clearly be seen, sounding should be resorted to.

See also Note at the end of this route.

(d) May to September (Alternative Route (1)*).*—Take the last Route (c) to lat. 8° 00′ N., long. 60° 00′ E., and from this point steer for lat. 13° 10′ N., long. 54° 50′ E., passing 60 miles from the north-east end of Socotra, and thence direct to destination.

CAUTION. It is always dangerous to pass near, or to weather Socotra, in the South-West Monsoon, as the land is often shrouded in mist, and the depths are so considerable that sounding gives no warning of proximity to the dangers which extend some distance from the shore. Moreover, there is little to be gained, in point of time, by passing close to the island, as vessels passing 40 miles northward of it only add 8 miles to the distance from Colombo to Aden. No vessel should, therefore, attempt to make the island, or pass it within 40 miles, when bound westward; more especially in the South-West Monsoon.

(e) May to September (Alternative Route (2)*).*—*Suitable only to vessels of large size and high power.*—From Colombo, steer for the position off south end of Minicoy, and thence on a direct Rhumb line to lat. 10° 00′ N., long. 60° 00′ E. Thence proceed direct to lat. 13° 10′ N., long. 54° 50′ E., off the north-east end of Socotra, and thence direct to destination.

Low-powered vessels.

(f) May to September.—From Colombo, steer for the Eight-degree channel (*see* (c) above); thence first to lat. 6° 00′ N., long. 67° 00′ E., then to lat. 6° 00′ N., long. 60° 00′ E., then to 8° 00′ N., long. 52° 40′ E., and thence, round Capo Guardafui to destination.

(g) Alternative Route (3).—From Colombo, if in a vessel of medium power, pass through Eight Degree channel, giving Turakuna islet, the northern extreme of Ihavandiffulu atoll, a good berth, particularly at night, for the current may be variable, but it generally sets to the south-eastward in the South-West Monsoon season. Then steer for a position lat. 7° 00′ N., long. 56° 00′ E. (nothing to the northward) which is well south of the south-eastern extreme of the area of strong current and confused swell southward of Socotra which should be avoided. From this position pass through lat. 8° 00′ N., long. 52° 30′ E., and shape course to pass Capo Guardafui, passing within sight of Ras Hafun if in daylight and clear weather, and over the bank of soundings off Ras Scenaghef. Thus wind, sea and current will be on the port quarter. After rounding Capo Guardafui and after passing Capo Elefante (Ras Filuk or Ras al Fil), keep the African shore on board as far as the Mait island, thus avoiding adverse currents to the northward, keeping in smooth water and possibly carrying a favourable current which is sometimes experienced hereabouts. From Mait island steer as requisite for Aden.

(h) Alternative Route (4).—For slow vessels, provided that the time of departure from Colombo and speed can be regulated to make Olivelifuri island, Fadiffolu atoll, between sunrise and noon, the following route is recommended:—

From Colombo shape course to pass close southward of Olivelifuri island and, passing through Kardiva channel and southward of Horsburgh atoll, steer to cross the meridian of 60° 00′ E. in lat. 4° 44′ N. Thence alter course to pass through a position in lat. 8° 00′ N., long. 52° 30′ E. and then as directed in Alternative Route (3) above.

If it is decided to use this route, time of sailing should be subject to special consideration, having regard to the weather conditions reported by wireless from vessels at sea, as frequently the South-West Monsoon is fresh south-westward of Colombo with corresponding sea.

(i) Alternative Route (5).—When it is not considered advisable for slow vessels to use Route (h) (Alternative Route (4)), the route given below is advantageous:—

From Colombo steer for the One-and-a-half-degree channel and, after passing the Maldive islands, steer a westerly course, crossing the meridian of 60° 00′ E. near lat. 2° 00′ N.; thence for lat. 8° 00′ N., long. 52° 30′ E., and then as given above in (g).

By this route, although it considerably lengthens the distance over the ground, vessels are most likely to avoid bad weather and will probably save time and fuel by doing so. *All small vessels should use this route.*

(j) Alternative Route (6).—For medium and slow vessels, whose masters do not wish to use the southern route, the following route could be followed:—

From Colombo follow Route (g) (Alternative Route (3)) to the meridian of 61° 00′ E.; then alter course to pass 40 miles to the northward of Ras Radressa, thus bringing wind and sea on the beam, when they increase and are at their worst. After passing Ras Radressa follow (e) (Alternative Route (2)) to Aden.

For passage onward from Aden through the Red sea, *see* Route 302.

Distances from Colombo to Aden by the above routes:—

By route (a), 2,094 miles.
By route (b), 2,116 miles.
By route (c), 2,293 miles.
By route (d) (Alternative route (1)), 2,288 miles.
By routs (e) (Alternative Route (2)), 2,210 miles.
By route (f), 2,290 miles.
By route (g) (Alternative Route (3)), 2,255 miles.
By route (h) (Alternative Route (4)), 2,295 miles.
By route (i) (Alternative Route (5)), 2,496 miles.
By route (j) (Alternative Route (6)), 2,212 miles.

Notes.—During the South-West Monsoon, better conditions of wind and sea are undoubtedly found in the route southward of Socotra, with consequent large saving of fuel and wear and tear.

As regards visibility, there is little to choose between the landfall of Socotra and of Ras Scenaghef. After passing the latter point, it will be found that between it and Capo Guardafui the air is not so heavily charged with moisture, and the land can be seen at a greater distance. The sea also becomes considerably smoother, and a strong favourable current will be experienced. If the visibility is bad on making Ras Scenaghef, there is a well-defined bank of soundings extending for 30 to 40 miles from the land in the vicinity; and it will be found an invaluable safeguard.

Though the passage off Capo Guardafui is 40 miles in width, should any doubt exist as to a ship's position, she should take the route northward of Socotra, where there is at least, sea-room, if stormy.

The alternative route, northward of Socotra, given in route (d), (e), or (j), above, is preferred by some navigators, however, on account of the unpredictable variabilities in the currents to the southward, and of the rocky dangers in the vicinity of the passage. There is also the uncertainty of the sea horizon (during the S.W. Monsoon), and consequent difficulty of getting accurate sights when nearing the land.

If the track north of Socotra be adopted, no attempt should be made, night or day, to sight the island in the neighbourhood of Ras Radressa, because it is in the track of the strongest part of the South-West Monsoon, and the currents are strong and irregular; the haze, also, is very deceptive, and there is no bank of soundings by which a vessel's position can be located with any certainty.

The southern route should be taken only by navigators accustomed frequently to fix a ship's position by sights; and also, when necessary, to "feel the way" by continuous and methodical sounding.

When Wireless Direction-Finding Stations have been re-established in the vicinity, the southern route should preferably be taken by all vessels able to employ this means of fixing position.

Route 400. Colombo to Jāsk and the Persian gulf

Follow the Indian coast at a safe distance to lat. 12° 00′ N., long. 74° 40′ E., and from thence a direct Rhumb line track to Jāsk, and thence proceed as navigation permits to destination. *See* Persian Gulf Pilot for passages in the Gulf.

Distances from Colombo to Persian gulf are:—

To Bahrein, 2,114 miles; to Fao, 2,291 miles; to Jāsk, 1,709 miles; to Muscat, 1,596 miles.

Route 401. Colombo to Bombay or Karāchi

Proceed as directly as navigation permits along the west coast of India, at all seasons. *See* notes at the end of Route 392, Bombay to Karāchi and Persian gulf.

Distance from Colombo to Bombay, 889 miles; to Karāchi, 1,341 miles.

Route 402. Colombo to ports in Bay of Bengal or to Malacca strait

Proceed first to a position in lat. 6° 00′ N., long. 80° 00′ E., off Point de Galle; and thence in all cases as direct as navigation permits, at all seasons of the year. *See* Caution as to currents off south and east coasts of Ceylon, under Route 420 (a), Calcutta to Durban or Cape Town.

Distances from Colombo are:—

To Calcutta, 1,244 miles; to Madras, 590 miles; to Malacca, 1,444 miles; to Mergui, 1,276 miles; to Penang, 1,276 miles; to Rangoon, 1,249 miles; to Singapore, 1,567 miles; to Wé island, 976 miles.

For routes onward from Singapore to ports in the Pacific, *see* Part IV., Chapter III.

Notes.—Bengal passage.—Formed between the islands of Breueh (Brœh) and Wé, about 11 miles wide and very deep, is the best approach for vessels to Malacca strait from the westward. South-west or north-east winds, according to time of year, always prevail and are fairly steady.

Vessels should approach the passage from northward of North-west islet, to avoid the dangers between it and Breueh (Broeh); thence as requisite for Oelee Lheue (Olehleh), or along the north coast of Sumatra, through Malacca passage.

There is generally a north-westerly current of from one knot to 2 knots through the fairway of Bengal passage; and it is advisable for *low-powered steamers* to keep near the western shore, where the streams are tidal, and where anchorage may be taken if necessary until the flood, or south-east-going stream makes.

It is the best passage at all times when proceeding westward.

Route 403. Colombo to Soenda (Sunda) straat and North Australian ports

(a) Via Singapore.—Proceed to Singapore as in Route 402, above and from Singapore as in Route 441 (a), (b), or (c), Singapore to Thursday island.

(b) Via Soenda straat.—All seasons.—From the position off Point de Galle *(See* Route 402), steer direct to either lat. 5° 15′ S., long. 102° 30′ E., or lat. 6° 25′ S., long. 102° 30′ E., depending on whether the approach to Soenda straat is to be made to the north, or to the south of Telanjang (Enggano); thence three routes may be taken.

(i) Pass through Soenda straat and then steer along the north coast of Java and, passing through Straat Sapoedi and Straat Wètar, proceed to destination as directly as navigation permits. For details *see* Eastern Archipelago Pilot, Vol. II.

(ii) Steer to round the south-west point of Java, thence along the south coast of Java and through Roti straat, south of Timor; thence as direct as navigation permits to destination *(but see also* Route 447 (c), which may be taken in reverse).

(iii) First proceed as direct as navigation permits to a position in lat. 11° 30′ S., long. 118° 00′ E. and thence to destination.

(c) Low-powered vessels.—May to September.—From the position off Point de Galle, steer to cross long. 85° 00′ E. in lat. 4° 20′ N., long 90° 00′ E in lat. 2° 40′ N., and long 95° 00′ E. in lat. 0° 30′ N.

From the last position, a course may be taken to Soenda straat, either southward of the off-lying islands from Sumatra, or between these islands and the coast, as preferred, according to weather.

There are three of these coastal routes, Outer, Middle, and Inner; but the Outer route only, in the open sea, may be said to be free from danger, as the coast is only partially surveyed. The Middle route is the space between the chain of large islands in the offing, and the small islands adjacent to, and interspersed along the coast, from 10 to 30 miles distant from the mainland of Sumatra. The Middle route is frequently taken by coastal mail steamers from and to Djakarta (Batavia). The Inner route is that close along the coast, and between some of the islands and the dangers off it. It is not recommended, and those using it are generally obliged to anchor at sunset.

The distance from Colombo to Soenda straat is about 100 miles greater than in (b).

From Soenda straat the route is the same as for (b) (i).

Distances from Colombo are:—

To Soenda straat (*Lat. 6° 25′ S., Long. 105° 00′ E.*), 1,750 miles.

To Port Darwin by (a), 3,454 miles; by (b) (i), 3,443 miles; by (b) (ii), 3,326 miles; by (b) (iii), 3,329 miles.

To Thursday island by (a), 4,071 miles; by (b) (i), 4,010 miles; by (b) (ii), 3,987 miles; by (b) (iii), 4,002 miles.

The distances for (b) (i), (b) (ii), and (b) (iii) are via lat. 6° 25′ S., long. 102° 30′ E. Via lat. 5° 15′ S., long. 102° 30′ E., they are 17, 2, and 2 miles less respectively.

For routes onward from Thursday island to ports in the Pacific, *see* Section B., Part IV., Chapter II.

Route 404. Colombo to Fremantle

Steer at a safe distance from the coast of Ceylon to the southward, to a position off Point de Galle in lat. 5° 40′ N., long. 80° 00′ E. From this point, take the Great Circle track direct to Fremantle.

Note.—There is a difference of only 3 miles between the Rhumb line and the Great Circle track, but the latter is preferred, as it takes a ship at about 60 miles westward of the Cocos islands (instead of about 10 miles), which would be advantageous, if passing the islands at night. The Great Circle also offers a more satisfactory course through the counter-equatorial current, setting strongly to the eastward in this vicinity during most months of the year.

Distance from Colombo to Fremantle, 3,121 miles.

Route 405. Colombo to Cape Leeuwin (10 miles south of) and ports in Southern Australia

From the position off Point de Galle in lat. 5° 40′ N., long. 80° 00′ E., take the Great Circle track direct and thence proceed as in Route 313. *See* remarks under Route 452 regarding rounding Cape Leeuwin.

Distance from Colombo to Cape Leeuwin, 3,201 miles; to Adelaide, 4,366 miles; to Hobart, 4,826 miles; to Melbourne, 4,701 miles; to Sydney, 5,161 miles.

Route 406.—*Reserved as spare.*

(v) ROUTES FROM MADRAS

Route 407. Madras to Calcutta or Rangoon

In each case proceed as directly as navigation permits.

Distance from Madras to Calcutta, 775 miles; to Rangoon, 998 miles.

Route 408. Madras to Mergui

Proceed as directly as navigation permits through Preparis South channel, or through Coco channel to destination. Passage may be made also round the south of the Andaman islands, but the distance is 60 miles longer.

Distance from Madras to Mergui, 1,080 miles.

Route 409. Madras to Malacca strait and Eastern Archipelago

(1) To PENANG.—If bound to Penang steer to pass either through the Ten Degree channel between the Little Andaman island and Car Nicobar island; or through the Sombrero channel, between Katchall and Nancowry islands on the north, and Little Nicobar island on the south. The latter is the more direct (and is 30 miles in width), if it can be arranged to pass through it by daylight, but the difference in distance is only 10 miles.

(2) TO OTHER PORTS IN MALACCA STRAIT.—Steer as direct as navigation permits round Great Nicobar island to Bengal passage; and thence to destination. Directions for Bengal passage are given in the notes under Route 402.

(3) TO PORTS IN JAVA SEA AND EASTERN ARCHIPELAGO.—There are two routes, viz., one through Malacca strait via Singapore, and the other, passing west of Sumatra, via Soenda straat.

(a) Via Malacca strait.—Proceed as in Route 409 (2) above to Singapore and from thence follow the appropriate section of Route 686 to destination.

(b) Via Soenda straat (*Lat. 6° 25′ S., Long. 105° 00′ E.*).—Proceed by direct Rhumb line to Soenda straat and thence as direct as navigation will permit to destination.

Note.—A description of many of the channels through the Eastern archipelago will be found in Chapter II. of Section C., Part II.

Distances from Madras are:—

To Ambon, via (3) (a), 3,213, (b), 3,303 miles.
To Balik Papan, via (3) (a), 2,638, (b), 2,755 miles.
To Djakarta, via (3) (a), 2,076, (b), 2,000 miles.
To Malacca, via (2), 1,463 miles.
To Penkalen Susu, via (2), 1,215 miles.
To Penang, via (1), 1,277 miles.
To Singapore, via (2), 1,586 miles.
To Straat Soenda, via (3) (a), 2,107, (b), 1,912 miles.
To Surabaya, via (3) (a), 2,345, (b), 2,412 miles.
To Tarakan, via (3) (a) 2,895, (b), 3,100 miles.

For Routes onward from Singapore to ports in the Pacific, *see* Section B., Part IV., Chapter III.

Route 410. Madras to Australia

(1) To Port Darwin.—There are two main routes, between which there is only about 6 miles difference in the distance. The routes are:—

(a) Proceed via Malacca strait (see Route 409 (2), and then via Riouw, Karimata, Sapoedi and Lombok straten; thence direct to Port Darwin.

(b) Via Straat Soenda.—Take a Rhumb line track direct to a position in lat. 6° 25′ S., long. 102° 30′ E., and thence proceed by either of the Routes 403 (b) (i), (ii), or (iii), to Port Darwin.

(2) To Thursday island and to ports on the East Coast.—Again there are two main routes as in (a) and (b) below, route (a) being about 50 miles shorter.

(a) Proceed via Malacca strait (see Route 409 (2)), Riouw, Karimata and Sapoedi straten, and thence either through Lombok, Soemba, and Roti straten, or continue eastward from Sapoedi straat to pass through Wètar straat, the latter being the more direct. In either case proceed as direct as navigation will permit from either Roti straat or Wètar straat to Thursday island.

An alternative route from the Malacca strait to the Java sea is via Doerian, Berhala and Banka straten, and thence to Sapoedi straat.

Note.—In the North-West Monsoon, vessels may find it advantageous, after entering the Java sea, to steer for the south end of Celebes, pass through Saleier straat and thence to Wètar straat.

(b) Via Straat Soenda.—Take a Rhumb line track direct to a position in lat. 6° 25′ S., long. 102° 30′ E., and thence proceed by either of the Routes 403 (b) (i), (ii), or (iii), to Thursday island.

Distances from Madras.

To Port Darwin: Via (1) (a), 3,473 miles; via (b) and 403 (b) (i), 3,605 miles; via (1) (b) and 403 (b) (ii), 3,488 miles; via (1) (b) and 403 (b) (iii), 3,491 miles.

To Thursday island: Via (2) (a) and Wetar strait, 4,090 miles; via (2) (b) and 403 (b) (i), 4,171 miles; via (2) (b) and 403 (b) (ii), 4,149 miles; via (2) (b) and 403 (b) (iii), 4,164 miles.

(3) To ports on East Coast of Australia.—Proceed by Route 410 (2) (a) or (b) to Thursday island and thence by Route 444 to destination.

Distances are obtained by the sum of those given in the above routes.

(4) To Fremantle.—Take a Great Circle or Rhumb line track direct. There is only about 5 miles difference, but the Great Circle passes considerably nearer to the Cocos islands, the Rhumb line passing about 100 miles east of those islands.

(5) To Cape Leeuwin and ports to the eastward.—Take a Rhumb line track direct to a position in lat. 34° 32′ S., long. 115° 08′ E., 10 miles south of Cape Leeuwin, and join Route 313 to destinations.

Distances from Madras are:—

To Port Darwin and Thursday island *see* under (2) above.

To Adelaide, 4,645 miles; to Cape Leeuwin, 3,480 miles; to Fremantle, 3,389 miles; to Hobart, 5,105 miles; to Melbourne, 4,980 miles; to Sydney (by 5), 5,439 miles.

Note.—The distance to Sydney via Thursday island is 5,805 miles, *i.e.*, 366 miles longer, but better weather and less sea will be met.

Route 411. Madras to Colombo

Proceed as directly as navigation permits in all seasons. *See* Caution in Route 420 (a), and Note under Route 412.

Distance from Madras to Colombo, 590 miles.

Route 412. Madras to Mauritius, Durban or Cape Town

Proceed direct to a position in lat. 6° 29′ N., long. 81° 55′ E., to join Route 420 (a), (b), or (c), Calcutta to Durban or Cape Town, according to season.

Distances from Madras to each port is 654 miles less than those given from Calcutta in Route 420 mentioned above.

Note.—Giving the east coast of Ceylon a wide berth (*see* Caution under Route 420 (a)) adds about 20 miles to the distance.

Route 413. Madras to Seychelles and Mombasa

Proceed direct to a position in lat. 6° 29′ N., long. 81° 55′ E., to join Route 422, Calcutta to Seychelles and Mombasa.

Distances from Madras are 654 miles less than those given from Calcutta. *See* Note under Route 412.

Route 414. Madras to Aden

Steer to pass round the east and south coasts of Ceylon *(see* Caution in Route 420, Calcutta to Durban or Cape Town), and thence to join the appropriate part of Route 399 (a) to (j), Colombo to Aden, in the following positions:

(a) Off Minicoy in the Eight Degree channel: 399 (a), (b), and (e).

(b) Lat. 7° 30′ N., long. 72° 45′ E. in the Eight Degree channel: 399 (c), (d), (f), (g), and (j).

(c) Kardiva channel: 399 (h).

(d) One-and-a-half-degree channel: 399 (i).

Distance from Madras to Aden is greater than that given in Route 399 (a) to (j) as follows: By (a), 557 miles; by (b), 547 miles; by (c), 527 miles; by (d), 494 miles.

Route 415. Madras to Persian gulf, Karāchi, or Bombay

Steer to pass round the east and south coasts of Ceylon *(see* Caution in Route 420, Calcutta to Durban or Cape Town) and thence to join Route 400, Colombo to Persian gulf, or Route 401, Colombo to Bombay or Karāchi, in a position in lat. 8° 00′ N., long. 77° 15′ E., southward of Cape Comorin.

Distance from Madras is 566 miles greater than those given in Routes 400, Colombo to Persian gulf, and 401, Colombo to Bombay, or Karāchi.

Route 416.—*Reserved as spare.*

(vi) ROUTES FROM CALCUTTA

Route 417. Calcutta to Rangoon, Mergui, Malacca strait and Singapore

Proceed as directly as navigation permits to all destinations, in all seasons.

Distance from Calcutta to Malacca, 1,527 miles; to Mergui, 880 miles; to Penang, 1,301 miles; to Rangoon, 799 miles; to Singapore, 1,650 miles.

Route 418. Calcutta to Eastern archipelago, North-west, North and East Australia

The best route is via Singapore (Route 417) from the vicinity of which port take routes as follows:—

(1) To Eastern archipelago.—Follow Route 686 (1) to (8), according to destination.

(2) To North-west Australia (Onslow or Broome), or to Port Darwin.—Follow Route 440 (3).

(3) To Thursday island and ports in Eastern Australia.—Follow Route 441 (a), (b), or (c). *See* also note below.

Note.—Another route to Thursday island is to steer from Calcutta to cross the Equator in long. 95° 00′ E., and thence to a position in lat. 6° 25′ S., long. 102° 30′ E., to the westward of Straat Soenda; thence proceed by Route 403 (b) (i), (ii) or (iii). The distance from Calcutta to Thursday island by the shortest of these routes is about 250 miles longer than that by (3) above *(See* distances below).

Distances from Calcutta:—

To Ambon, 3,277 miles; to Djakarta, 2,140 miles; to Balik Papan, 2,702 miles; to Brisbane, 5,466 miles; to Broome, 3,313 miles; to Melbourne, 6,434 miles; to Onslow, 3,433 miles; to Port Darwin, 3,532 miles; to Sydney, 5,869 miles; to Tarakan (via Balabac), 2,959 miles; to Tarakan (via S. of Borneo), 3,147 miles; to Thursday island, 4,154 miles.

Note.—The distance to Sydney is about 115 miles less for a vessel proceeding via Cape Leeuwin *(see* Route 419).

Route 419. Calcutta to Fremantle and Cape Leeuwin, and to ports in South and East Australia.

Proceed by either of the following two routes.

(a) Direct route.—Steer on a direct Rhumb line to cross the Equator in long. 94° 30′ E., and thence on a second Rhumb line to Fremantle or to a position in lat. 34° 32′ S., long. 115° 08′ E., about 10 miles south of Cape Leeuwin, and join Route 313.

(b) Via Singapore.—Proceed via Malacca strait, Singapore and Soenda straat *(see* Route 440), taking a Rhumb line from the latter to Fremantle, or Cape Leeuwin. The distance is about 150 miles more than by (a), but a rather smoother passage may be expected. Join Route 313 off Cape Leeuwin for ports in South and East Australia.

Distances from Calcutta by (a), are:—

To Albany, 3,963 miles; to Adelaide, 4,959 miles; to Cape Leeuwin, 3,794 miles; to Fremantle, 3,684 miles; to Hobart, 5,419 miles; to Melbourne, 5,294 miles; to Sydney, 5,754 miles.

Route 420. Calcutta to Mauritius, Durban or Cape Town

(a) April and October (West of Madagascar).—Steer first on a Rhumb line track to lat. 7° 25′ N., long. 82° 45′ E., a position about 50 miles from the east coast of Ceylon; and thence as direct as navigation permits around the south-eastern end of the island, passing through lat. 6° 29′ N., long. 81° 55′ E. *(see* Route 412).

Having rounded the south-east of Ceylon, steer for the One-and-a-half-degree channel in the southern Maldives, passing at about 20 miles from the southern point of Ceylon, to lat. 1° 15′ N., long. 73° 20′ E. Steer a direct track thence, passing 40 to 50 miles eastward of Iles Glorieuses and Geyzer reef, to a position off Ile Juan de Nova, lat. 17° 00′ S., long. 42° 15′ E.; and thence to join Route 319 (a), Aden to Durban or Cape Town in lat. 21° 00′ S., long 37° 45′ E.

CAUTION. Strong and variable currents are experienced around the southern Ceylon coast during both monsoons; and a wide berth (as indicated above) should be given it. A south-westerly set has sometimes been experienced, with a rate of 2 knots, towards Komariya ridge; a dangerous off-lying shoal in lat. 7° 02′ N., long. 81° 54′ E.; and this should be guarded against.

(b) November to March (East of Madagascar).—Steer on a Rhumb line first to lat. 7° 25′ N., long. 82° 45′ E., off the east coast of Ceylon *(See* Caution under (a), above). Thence, after rounding the south-east end of Ceylon and passing through lat. 6° 29′ N., long. 81° 55′ E. *(See* Route 412), steer on a second Rhumb line to lat. 8° 00′ S., long. 69° 00′ E., passing about 60 miles north-westward of the Chagos archipelago. Thence take another Rhumb line to a position lat. 17° 05′ S., long. 55° 50′ E., passing about 40 miles south-eastward of the Saya de Malha bank, and thence, passing 120 miles westward of Réunion, to lat. 26° 50′ S., long. 47° 40′ E., to join Route 352 (1) or (2).

(c) May to September (East of Madagascar).—Steer first to lat. 7° 25′ N., long. 82° 45′ E. *(See* Caution under (a), above). Thence steer to pass 30 miles eastward of Diego Garcia island and thence to pass 60 miles southward of Mauritius (or to call at Mauritius, if desired); thence continue to lat. 26° 50′ S., long. 47° 40′ E., to join Route 352 (1) or (2).

Distances from Calcutta are:—

To Cape Town by (a), 5,588 miles; by (b), 5,470 miles; by (c), 5,540 miles.

To Durban, by (a), 4,798 miles; by (b), 4,750 miles; by (c), 4,820 miles.

To Mauritius, by (c), 3,217 miles.

See Note under Route 412.

Route 421. Calcutta to Colombo

Steer first to a position in lat. 7° 25′ N., long. 82° 45′ E., and thence as direct as safe navigation permits to Colombo. *See* Caution in Route 420 (a).

Distance from Calcutta to Colombo, 1,244 miles.

Route 422. Calcutta to Seychelles and Mombasa

Follow Route 420 (a) to a position in the One-and-a-half-degree channel in lat. 1° 15′ N., long. 73° 20′ E., and thence steer direct to Mombasa, breaking off after crossing long. 60° 00′ E., if bound to Seychelles.

Distance from Calcutta to Mombasa, 3,701 miles; to Seychelles (Mahé), 2,791 miles.

Route 423. Calcutta to Aden

Steer direct to a position in lat. 7° 25′ N., long. 82° 45′ E., and thence, passing round the south coast of Ceylon *(See* Caution in Route 420 (a)), join Route 399 (a) to (j), Colombo to Aden, at the points indicated in Route 414, Madras to Aden.

Distances from Calcutta are 654 miles greater than those given from Madras in Route 414, Madras to Aden.

Route 424. Calcutta to Persian gulf, Karāchi, or Bombay

Steer direct to a position in lat. 7° 25′ N., long. 82° 45′ E., and thence to join Route 415, Madras to Persian gulf, Karāchi, or Bombay, off south-east coast of Ceylon.

Distances from Calcutta are 1,220 miles greater than those given in Route 400, Colombo to Persian gulf, and Route 401, Colombo to Bombay, or Karāchi.

Route 425.—*Reserved as spare.*

SECTION B. PART III.

Chapter V

ROUTES FROM PORTS ON THE EASTERN SIDE OF THE INDIAN OCEAN

(i) ROUTES FROM RANGOON

Route 426. Rangoon to Malacca strait, Singapore and Eastern archipelago

Proceed as direct as navigation permits to Malacca strait and Singapore. For routes onward from Singapore to ports in the Eastern archipelago, *see* Route 686.

Distances from Rangoon are:—

To Ambon, 2,744 miles; to Balik Papan, 2,169 miles; to Djakarta, 1,607 miles; to Malacca, 994 miles; to Mergui, 350 miles; to Penang, 766 miles; to Pangkalan Susu, 785 miles; to Singapore, 1,117 miles; to Tarakan, 2,426 miles.

Route 427. Rangoon to North-western Australia, Port Darwin or Thursday Island

Proceed via Singapore *(see* Route 426), and thence take routes as follows:—

(1) To NORTH-WESTERN AUSTRALIA OR PORT DARWIN.—Route 440 (3), Singapore to Onslow, or Broome (North-western Australia), or to Port Darwin.

(2) To THURSDAY ISLAND.—Route 441, Singapore to Thursday island, etc.

Distances from Rangoon via Singapore are:—

To Broome, 2,775 miles; to Onslow, 2,895 miles; to Port Darwin, 2,998 miles; to Thursday island, 3,616 miles.

For routes onward from Thursday island to the Pacific ocean, *see* Section B., Part IV., Chapter II.

Route 428. Rangoon to ports in East, South and South-western Australia

(1) To FREMANTLE OR TO CAPE LEEUWIN.—There are two routes from Rangoon.

(a) Direct route.—Proceed as direct as navigation permits round the north-west of Sumatra and thence, as soon as clear of the islands off the west coast, take a direct Rhumb line to Fremantle or to Cape Leeuwin.

(b) Via Malacca strait.—Proceed via Malacca strait (*See* Route 426), Doerian, Berhala and Banka straten, to Soenda straat; thence take a Rhumb line to Fremantle or to Cape Leeuwin. This route is about 44 miles longer than (a).

(2) To PORTS ON THE SOUTH COAST OF AUSTRALIA AND TO SYDNEY.—Proceed as in (1) above to a position about 10 miles south of Cape Leeuwin to join one of Routes 313 (2) to (5), Aden to Cape Leeuwin, South Australian ports and Sydney.

(3) To PORTS ON THE EAST COAST OF AUSTRALIA (including SYDNEY).—Follow Route 427 (2) to Thursday island and proceed thence by Route 444 (1), Thursday island to Australian ports.

Distances from Rangoon are:—

To Adelaide, 4,527 miles; to Albany, 3,531 miles; to Brisbane, 4,933 miles; to Cairns, 4,121 miles; to Cape Leeuwin, 3,362 miles; to Fremantle, 3,252 miles; to Hobart, 4,987 miles; to Melbourne, 4,862 miles; to Sydney (via (2)), 5,322 miles; to Sydney (via (3)), 5,336 miles.

Note.—The equidistant meeting place of the east-about route via Thursday island, and the west-about route, via Cape Leeuwin, being about 7 miles north of Sydney, there is no advantage in distance by either route to that port; but on the east-about route smoother seas will be carried for a greater part of the distance.

Route 429. Rangoon to Mauritius, Durban and Cape Town

(a) April and October (West of Madagascar).—Steer on a direct Rhumb line to a position in lat. 7° 25′ N., long. 82° 45′ E., to join Route 420 (a), Calcutta to Mauritius, Durban or Cape Town.

(b) September to May (except April and October) (East of Madagascar).—Steer for the position in lat. 7° 25′ N., long. 82° 45′ E., to join Route 420 (b), Calcutta to Mauritius, Durban or Cape Town.

(c) June to August, via Mauritius.—During the S.W. monsoon period, steer from Rangoon to lat. 5° 50′ N., long. 94° 30′ E., on a direct Rhumb line track; thence on a Rhumb line direct to Mauritius, and thence as in Route 420 (c).

Distance from Rangoon are:—

To Cape Town, by (a), 5,593 miles; by (b), 5,570 miles; by (c), 5,595 miles.

To Durban, by (a), 4,798 miles; by (b), 4,850 miles; by (c), 4,851 miles.

To Mauritius, by (c), 3,300 miles.

Note.—The direct distance to Mauritius, passing northward of the Andaman islands, is 3,210 miles.

Route 430. Rangoon to Seychelles and Mombasa

(a) September to May.—Steer directly past the northern end of the Andaman islands to round Ceylon at a safe distance *(see* Caution under Route 420 (a)), and thence to the One-and-a-half-degree channel in the Southern Maldive islands, and thence on a Rhumb line to either destination.

(b) June to August.—Steer first to lat. 5° 50′ N., long. 94° 30′ E.; thence to lat. 2° 30′ N., long. 90° 00′ E., thence to lat. 2° 00′ S., long. 75° 00′ E., and thence on a direct Rhumb line to destination.

Distance from Rangoon to Mombasa, by (a), 3,672 miles; by (b), 3,867 miles. To Seychelles (Mahé), by (a), 2,738 miles; by (b), 2,928 miles.

Route 431. Rangoon to Aden

See Cautions regarding rounding Capo Guardafui and Socotra and notes in Route 399, Colombo to Aden.

(a) September to May.—Steer first for a position off Point de Galle in lat. 5° 40′ N., long. 80° 00′ E. Thence (if not calling at Colombo), steer to pass the north extreme of the Maldive islands in lat. 7° 30′ N., long. 72° 45′ E. (" The Eight Degree channel "). From this point steer directly on a Rhumb line for Capo Guardafui, passing southward of Socotra, and thence to destination.

(b) September to May (Alternative).—Proceed as above to the Eight Degree channel, and thence take a Rhumb line track to a position in lat. 13° 10′ N., long. 54° 50′ E., north-eastward of Socotra, and proceed direct to destination.

(c) June to August.—Steer first for lat. 5° 50′ N., long. 94° 30′ E., thence for a position 5° 40′ N., long. 80° 00′ E., off Point de Galle. From this point there are three alternative routes; for which, *see* Route 399 (c), (d) and (e), Colombo to Aden.

(d) June to August (Medium-powered vessels).—If medium-powered vessels proceed via Point de Galle as in (c), above, and not on the low-powered vessels route (e), they should continue the voyage as given in Route 399 (g).

See Section D. Part II. Index on pages 349 and 350.

(e) Low-powered vessels.—June to August.—Steer first to lat. 5° 50′ N., long. 94° 30′ E., thence direct for the One-and-a-half-degree channel (*Lat. 1° 15′ N., Long. 73° 20′ E.*). From this point steer for lat. 5° 50′ N., long. 60° 00′ E., then to lat. 8° 00′ N., long. 52° 40′ E., and thence round Capo Guardafui to Aden. *See* Route 399 (a), for rounding Capo Guardafui, and Cautions and Notes in that route.

(f) Low-powered vessels—June to August (Alternative).—Proceed as in (e) above to the One-and-a-half-degree channel, and continue thence as given in Route 399 (i).

Distances from Rangoon to Aden by the various routes are:—

By (a), 3,309 miles.
By (b), 3,331 miles.
By (c) and 399 (c), 3,856 miles.
By (c) and 399 (d), 3,850 miles.
By (c) and 399 (e), 3,773 miles.
By (d), 3,818 miles.
By (e), 3,847 miles.
By (f), 3,944 miles.

For passage onward into the Red sea, *see* Route 302.

Route 432. Rangoon to Colombo

(a) September to May.—Steer direct Rhumb line to round Point de Galle at about 5 miles distance; and thence as directly as navigation permits to Colombo.

(b) June to August.—Steer for lat. 5° 50′ N., long. 94° 30′ E., and thence round Point de Galle to Colombo, keeping at about 10 miles from the coast of Ceylon.

Distance from Rangoon to Colombo by (a), 1,249 miles; by (b), 1,553 miles.

Route 433. Rangoon to Persian gulf, Karāchi or Bombay

Proceed to round Point de Galle as in Route 432, Rangoon to Colombo, and thence steer to a position in lat. 8° 00′ N., long. 77° 15′ E., off Cape Comorin, to join one of the following routes from Colombo:—

To Persian gulf, Route 400; to Bombay, or Karachi, Route 401.

Distances from Rangoon are (September to May):—

To Bahrein, 3,342 miles; to Bombay, 2,117 miles; to Bushire, 3,402 miles; to Calicut, 1,617 miles; to Fao, 3,519 miles; to Jāsk, 2,937 miles; to Karāchi, 2,569 miles; to Muscat, 2,824 miles.

Note.—In the South-West Monsoon route (June to August), the above distances are increased by about 300 miles.

Route 434.—*Reserved as spare.*

(ii) ROUTES FROM SINGAPORE

For Routes from Singapore to ports in the Pacific ocean, see Section B., Part IV., Chapter III.

Route 435. Singapore to ports in Malacca strait and Bay of Bengal

Proceed in all cases as directly a navigation permits.

Distances from Singapore are:—

To Calcutta (via Preparis South channel), 1,650 miles; to Madras (via Bengal passage), 1,586 miles; to Malacca, 122 miles; to Mergui, 815 miles; to Pangkalan Susu, 405 miles; to Penang, 376 miles; to Rangoon, 1,117 miles; to Sabang, 601 miles.

See Note on Bengal passage under Route 402.

Route 436. Singapore to Colombo, Bombay, Karāchi and Persian gulf

Proceed as directly as navigation permits to a position off Point de Galle in lat. 5° 40′ N., long. 80° 00′ E., passing through Bengal passage. *(See* Note under Route 402). From Point de Galle proceed as follows:—

(1) To Colombo.—Direct as navigation permits.

(2) To Bombay, Karāchi, and Persian gulf.—Proceed to a point in lat. 8° 00′ N., long. 77° 15′ E., off Cape Comorin, to join Route 400, for the Persian gulf, or Route 401 for Bombay or Karāchi.

Note.—A strong set to the westward, round the south extreme of Ceylon will be experienced during the North-East Monsoon; and to the eastward, during the South-West Monsoon.

Distances from Singapore are:—

To Bahrein, 3,660 miles; to Bombay, 2,435 miles; to Bushire, 3,720 miles; to Colombo, 1,567 miles; to Fao, 3,837 miles; to Jāsk, 3,255 miles; to Karāchi, 2,887 miles; to Muscat, 3,142 miles.

Route 437. Singapore to Aden

See Route 302 for passage onward through the Red sea. *See also Cautions* regarding rounding Capo Guardafui and Socotra, and Notes in Route 399, Colombo to Aden.

In all seasons steer to pass through Bengal passage (*See* note under Route 402), to lat. 5° 40′ N., 80° 00′ E., off Point de Galle, and thence:

(a) October to April.—Proceed direct to join Route 399 (a) or (b) off Minicoy island in lat. 8° 06′ N., long. 73° 00′ E.

(b) May to September.—Proceed from the position off Point de Galle to make the Eight Degree channel in lat. 7° 30′ N., long. 72° 45′ E., and follow Route 399 (c), (d), or (e).

Note.—A medium-powered vessel, not wishing to use (c) below, and proceeding via Point de Galle, should continue her voyage as given in Route 399 (g).

(c) Low-powered vessels.—May to September.—From Bengal passage, steer for the One-and-a-half-degree channel (*Lat. 1° 15′ N., Long. 73° 20′ E.*), thence to lat. 5° 50′ N., long. 60° 00′ E., thence to lat. 8° 00′ N., long. 52° 40′ E.; and thence round Capo Guardafui to destination.

(d) Low-powered vessels.—May to September (Alternative).—From Bengal passage, steer for the One-and-a-half-degree channel, and thence follow Route 399 (i).

Distances from Singapore to Aden by the routes above are:—

By (a) and 399 (a), 3,645 miles.
By (a) and 399 (b), 3,667 miles.
By (b) and 399 (c), 3,837 miles.
By (b), 399 (d), 3,832 miles.
By (b) and 399 (e), 3,754 miles.
By (c), 3,828 miles.
By (a) and 399 (i), 3,925 miles.

Route 438. Singapore to Seychelles or Mombasa

All seasons.—Make first for Bengal passage, and from thence steer to lat. 2° 30′ N., long 90° 00′ E.; thence to lat. 2° 00′ S., long. 75° 00′ E., and thence on a direct Rhumb line to Seychelles or Mombasa.

Distance from Singapore to Mahé, 3,067 miles; to Mombasa, 3,985 miles.

Note.—The route via Soenda straat to Mombasa is 4,489 miles.

Route 439. Singapore to Mauritius, Durban or Cape Town

(a) Via Malacca strait and Mauritius.—All seasons.—Make first for Bengal passage, and from there, pick up Route 429 (c) at lat. 5° 50′ N., long. 94° 30′ E., and follow directions there given to destination.

(b) Via Soenda straat (Cape Town only).—Proceed via Doerian, Berhala, and Banka straten to

Soenda straat *(see* Eastern Archipelago Pilot, Vol. IV.), and from thence take the Great Circle track, passing close northward of Cocos island to lat. 33° 45′ S., long. 36° 30′ E. From this point steer a direct Rhumb line course towards Algoa bay, picking up Route 319 (a), Aden to Cape Town in about lat. 34° 00′ S., long. 27° 00′ E., and proceeding along it to destination.

Note.—A description of many of the channels through the Eastern archipelago will be found in Section C., Part II., Chapter II.

Distance from Singapore: To Cape Town by (a), 5,611 miles; by (b), 5,650 miles; to Durban, 4,867 miles; to Mauritius, 3,324 miles.

Route 440. Singapore to Straat Soenda, Straat Lombok, and ports in North, West and South Australia

(1) To Soenda straat, Fremantle and Cape Leeuwin.—Proceed to Soenda straat via Dœrian, Berhala, and Banka straten *(see* Eastern Archipelago Pilot, Vol. IV.), or, if preferred, by Riouw straat and Gaspar straten, which is slightly longer. From Soenda straat, steer on a Rhumb line to either destination, passing Christmas island on its eastern side at a distance of about 20 miles.

See Note under Route 439 (b) above.

(2) To ports in Southern Australia.—From a position about 10 miles south of Cape Leeuwin *(see* (1) above), follow Route 313 (2) to (5) to destination.

(3) To Lombok straat and ports in North and West Australia.—Proceed by Riouw, Karimata, Sapoedi and Lombok straten to either destination. From Lombok straat take the direct Rhumb line in each case.

Distances from Singapore are:—

To Adelaide, 3,509 miles; to Albany, 2,543 miles; to Broome, 1,663 miles; to Cape Leeuwin (10 miles S. of), 2,344 miles; to Fremantle, 2,223 miles; to Hobart, 3,969 miles; to Melbourne, 3,844 miles; to Onslow, 1,783 miles; to Port Darwin, 1,887 miles; to Straat Lombok, 963 miles; to Soenda straat, 523 miles; to Sydney, 4,304 miles.

Note.—The distance from Singapore to Sydney, via Thursday island, is 4,224 miles by the Inner Route, but 4,469 miles and 4,556 miles via the two Outer Routes. *See* Routes 441 and 444.

Route 441. Singapore to Thursday island and ports in Eastern Australia

(a) April to October (South-East Monsoon).—Proceed via Riouw, Karimata, Sapoedi and Wètar straten, thence via either Endeavour strait, or Prince of Wales channel, and onward to destination as directly as navigation permits, either by the Inner, or Outer Route to ports in Queensland or New South Wales *(See* Route 444).

(b) November to March (North-West Monsoon).—When through Karimata straat, steer for the south end of Celebes; pass through Saleier straat and thence for Wètar passage and Straat Wètar, and on as above, in (a).

(c) Alternative Route (North-West Monsoon).—From Sapoedi straat, pass southwards through Lombok straat or Alas straat into Indian ocean; and thence proceed through Roti straat, southward of Timor, into the Arafura sea, and on to destination as above *(but see also* Route 447 (c) which may be taken in reverse).

For route through Riouw straat, *see* Eastern Archipelago Pilot, Vol. IV.

For route from Riouw straat to, and through Karimata straat, *see* Eastern Archipelago Pilot, Vol. IV.

For route from Karimata straat to Wètar passage and Wètar straat, including Sapoedi, Lombok, Alas and Saleier straten, *see* Eastern Archipelago Pilot, Vol. II.

For route from Wètar straat to Thursday island, *see* Australia Pilot, Vol. V.

For routes, Inner or Outer, from Thursday island to Sydney, *see* Australia Pilot, Vols. III. and IV., and Routes 444 and 507 (reversed).

Note.—A general description of many of the above channels and of others through the Eastern archipelago is given in Chapter II. of Section C., Part II.

Distances from Singapore by (a) are:—

To Brisbane (Inner route), 3,821 miles.

To Brisbane (Raine island, Outer route), 4,119 miles.

To Brisbane (Bligh passage, Outer route), 4,206 miles.

To Cairns, 3,006 miles.

To Newcastle (Inner route), 4,162 miles.

To Newcastle (Raine island, Outer route), 4,407 miles.

To Newcastle (Bligh passage, Outer route), 4,494 miles.

To Sydney (Inner route), 4,224 miles.

To Sydney (Raine island, Outer route), 4,469 miles.

To Sydney (Bligh passage, Outer route), 4,556 miles.

To Thursday island, 2,504 miles.

Distances by (b) are 4 miles less and by (c) 49 miles more.

See also Route 440 to Sydney.

For routes from Singapore to ports in Borneo, Eastern archipelago, and China seas, *see* Part IV., Chapter III.

Route 442.—*Reserved as spare.*

(iii) ROUTES FROM THURSDAY ISLAND

For Routes from Thursday island to the Eastern Archipelago and Pacific ocean, see Part IV., Chapter II.

Route 443. Thursday island to Singapore

On leaving Thursday island, either the direct route through Endeavour strait may be taken, or the far better known but longer route through the Prince of Wales channel. *See* Australia Pilot, Vol. III.

From this point there are three routes, as follows:—

(a) April to October.—Proceed via Roti straat, south of Timor, and by either Alas straat or Lombok straat into the Java sea, and thence via Sapoedi straat, Gaspar straat (or Karimata straat), and Riouw straat to destination.

Alternatively, proceed to Alas straat or Lombok straat northward of Timor and along the southern side of the islands as described in Route 447 (c). This route avoids most of the dangerous areas of the Arafura sea.

(b) November to March.—Proceed via Wètar straat and Wètar passage, northward of Timor, and thence via Gaspar straten (or Karimata straat), and Riouw straat to destination.

(c) All seasons.—Keep through the Arafura sea to the southward of all the islands, and then proceed via Soenda, Banka, Berhala and Doerian straten to destination.

Distances from Thursday island to Singapore by (a), 2,546 miles; by (b), 2,504 miles; by (c), 2,824 miles.

Note.—Route (c) has no advantage over the other two beyond greater ease of navigation.

Route 444. Thursday island to ports in Australia

The shortest distance to all main ports from Adelaide eastwards is east-about. To Albany and all ports to the west and north the shortest route is west-about.

(1) To ports in Queensland, New South Wales, Victoria, Tasmania, or South Australia.—Proceed by the Inner route (*see* Route 507 (a) reversed) to ports northward of Brisbane. To Brisbane, and ports to

the southward, take the Inner, or Outer route, the former being considerably shorter. *See* notes in Route 507, Sydney to Thursday island. For details of Inner and Outer routes *see* Australia Pilot, Vols. IV. and III.

(2) To Port Darwin, North-west Australia, Fremantle, or Albany.—The route to Port Darwin is as direct as navigation permits. For vessels bound to ports to the westward of Port Darwin, a route outside Holothuria banks and Browse island is recommended; thence, if bound to Fremantle, pass outside Monte Bello island, and through Geelvink channel.

Note.—The coastal mail-steamers utilise by day the channels inshore of Holothuria reefs, and between Long reef and Cape Voltaire. The navigation, however, is intricate. Vessels drawing over 12 feet should proceed slowly, and with caution.

Distances from Thursday island:—

To Adelaide, by (1), 2,676 miles.
To Albany by (2), 2,843 miles.
To Brisbane by (1), 1,317 miles.
To Cape Leeuwin by (1), 3,633 miles.
To Cape Leeuwin by (2), 2,674 miles.
To Fremantle by (2), 2,542 miles.
To Hobart by (1), 2,337 miles.
To Melbourne by (1), 2,285 miles.
To Port Darwin by (2), 733 miles.
To Sydney by (1), 1,720 miles.

Route 445. Thursday island to Durban, Cape Town, Mauritius or Mombasa

Proceed as directly as navigation permits to a position in lat. 11° 30′ S., long. 118° 00′ E., and thence as follows:

(1) To Durban.—Take a Great Circle track direct.

(2) To Cape Town.—Take a Great Circle track to a position in lat. 33° 45′ S., long. 36° 30′ E., to join Route 439 (b). From May to September it is advisable to take (1) above to Durban, and thence to Cape Town, to avoid the bad weather further south. The distance is about 150 miles longer.

(3) To Mauritius.—Take a Rhumb line track direct.

(4) To Mombasa.—*See* Route 533 (2) (b).

Distance from Thursday island to Cape Town, 6,981 miles; to Durban, 6,335 miles; to Mauritius, 4,975 miles; to Mombasa, 6,100 miles.

Route 446. Thursday island to Colombo

(a) Via Singapore.—Take either of Routes 443 (a), (b), or (c) to Singapore, and then proceed by Route 436 to Colombo.

(b) Via Straat Soenda.—Steer to pass through Wètar straat and Wètar passage; thence proceed along the north coast of Flores, through Sapoedi straat, along the north coast of Java, and through Soenda straat to a position in lat. 6° 25′ S., long. 102° 30′ E. From this point take a direct Rhumb line track to Point de Galle, and thence proceed as direct as navigation permits to destination.

(c) Via south of Java.—Steer to pass through Wètar, Ombai and Soemba straten *(see* Route 447 (c)*)*, and thence to keep south of Java to a position west of Straat Soenda in lat. 6° 25′ S., long. 102° 30′ E.; thence proceed as in (b) above.

(d) Low-powered vessels.—November to March.—Take Route 447 (b) (ii), as far as Point de Galle and thence continue as above.

Distances from Thursday island to Colombo are:—

By (a) and 443 (a), 4,113 miles.
By (a) and 443 (b), 4,071 miles.
By (a) and 443 (c), 4,391 miles.
By (b), 3,981 miles.
By (c), 3,976 miles.
By (d), 4,068 miles.

Route 447. Thursday island to Aden

For passage onward from Aden through the Red sea, *see* Route 302.

Of the routes described below, that under (c), which is strongly recommended for use from May to September, might profitably be followed during the remainder of the year as far as the passage through Wètar straat and Ombai straat is concerned. Thence as described in Route 446 (c) to Soenda straat.

(a) Via Singapore and Colombo.—Take Route 443 (a), (b), or (c) to Singapore, and either Route 437 (a), (b), (c), or (d), Singapore to Aden; or, if calling at Colombo, Route 436, Singapore to Colombo, and Route 399, Colombo to Aden.

The distance varies according to routes taken at different seasons.

(b) Via Soenda straat.—In all seasons take a route northward or southward of Timor *(see* Route 446 (b) or (c)) to a position in lat. 6° 25′ S., long. 102° 30′ E. for (i), (iv), and (v) below; or to lat. 5° 15′ S., long. 102° 30′ E., for (ii) and (iii) below, off the entrance to Soenda straat, and thence:—

(i) October to April.—Steer for a position lat. 8° 06′ N., long. 73° 00′ E., off Minicoy island on a Rhumb line, passing about 20 miles south-westward of Point de Galle, Ceylon (sighting it, if desired). Off Minicoy join Route 399 (a), or (b), Colombo to Aden.

(ii) Low-powered vessels.—November to March.—From the position in lat. 5° 15′ S., long. 102° 30′ E., off Soenda straat, steer northward inside Mentawi islands to pass out into the Indian ocean through Siberoet straat. Thence proceed on a curving course to Point de Galle, crossing the Equator in long. 97° 00′ E., and then the meridian of 95° 00′ E. in lat. 1° 50′ N.; 90° 00′ E. in lat. 5° 00′ N.; 85° 00′ E. in lat. 5° 30′ N. From Point de Galle steer for lat. 8° 06′ N., long. 73° 00′ E., off Minicoy, to join Route 399 (a), Colombo to Aden.

(iii) May to September.—From the position off Soenda straat, take a direct Rhumb line for the One-and-a-half-degree channel (*Lat. 1° 15′ N., Long. 73° 20′ E.*). From this point, steer on a Rhumb line, first to lat. 5° 50′ N., long. 60° 00′ E., and thence to lat. 8° 00′ N., long. 52° 40′ E., and thence, round Capo Guardafui to Aden. *See* Cautions and Notes in Route 399 regarding rounding Capo Guardafui and the passage onwards to Aden.

(iv) Low-powered vessels.—July and August.—From the position off Soenda straat, take a Rhumb line track to lat. 2° 30′ S., long. 65° 00′ E. Thence steer for lat. 8° 00′ N., long. 52° 40′ E., passing through lat. 1° 10′ S., long. 61° 30′ E. Thence steer to round Capo Guardafui, and thence to Aden. *See* Cautions and Notes in Route 399.

(v) Low-powered vessels.—April, May, June, September and October.—From the position off Soenda straat, take a Rhumb line course to lat. 8° 00′ S., long. 68° 00′ E., and from thence to lat. 8° 00′ N., long. 52° 40′ E., thence continue round Capo Guardafui to Aden. *See* Cautions and Notes in Route 399.

Note.—The above two routes (b) (iv) and (v) are recommended by Dutch navigators, as from the Dutch East Indies, for vessels of low power and small size.

(c) Southern Route.—May to September.—From Thursday island steer to a position in about lat. 10° 50′ S., long. 141° 00′ E., southward of Carpentaria light vessel and then shape course to pass round the north-east end of Timor, leaving the site of Victoria shoal about 15 miles to the southward. Having rounded the above point steer through Wètar straat and Ombai straat until, arriving at a position about 8 miles southward of Tanjong Laisoemboe (Laisumbu), keep further southward, steering for a position in lat. 9° 00′ S., long. 123° 30′ E.

From this point shape course through the Sawoe (Savu) sea and Soemba (Sumba) straat, passing about 10 miles southward of Ija (Iya) and Toren eiland, to a position in about lat. 9° 05′ S., long. 118° 45′ E., thence again edging southward to lat. 9° 30′ S., long. 116° 45′ E., which parallel should be followed to long. 113° 00′ E.

From this position steer acorss the Indian ocean to lat. 6° 30′ S., long. 80° 00′ E., crossing the meridian of 100° 00′ E. in lat. 8° 30′ S., and 90° 00′ E. in lat. 7° 30′ S.; thence pass northward of the Chagos archipelago in lat. 4° 00′ S., long. 73° 30′ E., and steer for a position in lat. 3° 00′ N., long. 57° 00′ E., crossing the Equator in about long. 64° 05′ E., and thence to lat. 8° 00′ N., long. 52° 40′ E. Alternatively, on reaching the Equator in long. 64° 05′ E., course may be shaped directly for lat. 8° 00′ N., long. 52° 40′ E., the choice depending on the strength of the monsoon prevailing at the time.

From lat. 8° 00′ N., long. 52° 40′ E., a course can be steered to approach Capo Guardafui from a profitable angle and, after rounding that cape, direct to Aden.

Low-powered vessels are recommended, when reaching lat. 4° 00′ S., long. 73° 30′ E., to steer first to a position in lat. 1° 00′ S., long. 60° 30′ E., before altering course northward to lat. 3° 00′ N., long. 57° 00′ E.; thence continuing as above.

Notes.—The above route was successfully taken by the P. & O. *s.s.* "*Perim*," in September, 1948, on a voyage from Brisbane; the Master, *J. C. Mellonie*, and his officers, strongly recommend it during the South-East Monsoon season in the Arafura sea, and consider that it could be followed throughout the year, especially by ships fitted with Radar, for use during the night when navigating between the steep-to islands; but even at night, with no moon, the high land was generally visible on both sides in the slight haze. Reliable weather reports were received from Port Darwin; in the cyclone season these would be especially valuable.

The following reasons were given for this route from Brisbane:—

(a) To avoid a winter passage to the westward across the Australian bight.

(b) To take full advantage of the strong favourable currents to be found during the South-East Monsoon in the Arafura sea.

(c) To save two or three days time, fuel, and wear and tear, by steaming throughout in fine weather and smooth waters.

Distances from Thursday island to Aden by (b) (i) to (v), via Wètar passage (Routes 446 (b) and (c)),

By (b) (i) and 399 (a), 6,012 miles.
By (b) (i) and 399 (b), 6,034 miles.
By (b) (ii), 6,125 miles.
By (b) (iii), 6,077 miles.
By (b) (iv), 6,208 miles.
By (b) (v), 6,354 miles.
By (c), 6,270 miles.

Route 448. Thursday island to Persian gulf, Karāchi, or Bombay

Take Route 446 (a), (b), (c), or (d), as far as Point de Galle, and thence steer to a point in lat. 8° 00′ N., long. 77° 15′ E., off Cape Comorin, to join Route 400 for the Persian gulf, or Route 401 for Karāchi or Bombay. *See* Note on current round Ceylon in Route 436.

Distance from Thursday island to ports in Persian gulf, Karāchi or Bombay is 20 miles *less* than the sum of the distance in Route 446, Thursday island to Colombo and Route 400, Colombo to Persian gulf, or Route 401, Colombo to Bombay or Karāchi. The distance will vary according to the chosen route in Route 446.

Route 449. Thursday island to ports in Bay of Bengal

(1) To CALCUTTA:

(a) Via Singapore.—Follow Route 443 (a), (b) or (c) to Singapore and join Route 435, north of Riouw straat or Doerian straat.

(b) South of Java.—Follow Route 443 (a) through Roti straat, and thence continue through Soemba straat and south and west of Java, to a position in lat. 6° 25′ S., long. 102° 30′ E., westward of Soenda straat; thence, as directly as possible, to cross the Equator in long. 95° E., and pass westward of the Nicobar islands, across the Bay of Bengal, to destination.

(2) To MADRAS:

(a) Via Singapore.—Proceed as in (1) (a).

(b) South of Java.—Proceed as in (1) (b) as far as lat. 6° 25′ S., long. 102° 30′ E., and thence steer as directly as navigation permits to Madras.

(3) To RANGOON.—Follow Route 443 (a), (b), or (c) to Singapore and thence continue by Route 435 as in (1) (a) above.

Distances from Thursday island are:—

To Calcutta via (1) (a), by 443 (a), 4,191 miles.
To Calcutta via (1) (a), by 443 (b), 4,149 miles.
To Calcutta via (1) (a), by 443 (c), 4,469 miles.
To Calcutta via (1) (b), 4,400 miles.
To Rangoon via (3), by 443 (a), 3,658 miles.
To Rangoon via (3), by 443 (b), 3,616 miles.
To Rangoon via (3), by 443 (c), 3,936 miles.
To Madras via (2) (a), by 443 (a), 4,127 miles.
To Madras via (2) (a), by 443 (b), 4,085 miles.
To Madras via (2) (a), by 443 (c), 4,405 miles.
To Madras via (2) (b), 4,200 miles.

For routes from Thursday island to ports in the Pacific ocean, *see* Part IV., Chapter II.

Route 450.—*Reserved as spare.*

(iv) ROUTES FROM FREMANTLE

Route 451. Fremantle to Port Darwin or Thursday island

Follow the reverse of Route 444 (2), Thursday island to Port Darwin, North-west Australia, Fremantle, and Albany.

Distance from Fremantle to Port Darwin, 1,841 miles; to Thursday island, 2,542 miles.

Route 452. Fremantle to Albany or Adelaide

Steer as directly as navigation permits so as to round Cape Leeuwin at a distance of not less than 15 miles; thence as follows:—

(1) To ALBANY.—Proceed as directly as navigation permits.

(2) To ADELAIDE.—Steer to get on to and follow the parallel of 35° 30′ S. to Investigator strait, and thence as directly as navigation permits to Adelaide (*see* Australia Pilot, Vol. I.).

Distance from Fremantle to Adelaide, 1,343 miles; to Albany, 350 miles; to Cape Leeuwin, 180 miles.

See Section D. Part II.

General directions.—Rounding Cape Leeuwin.—*See* Australia Pilot, Vols. I. and V.—The distance to which sunken dangers extend off a long stretch of coast about Cape Leeuwin, and the frequent thick weather that prevails with strong on-shore winds and an inset in the same direction, makes it very desirable to give a good berth to this dangerous point in all but settled weather. From 15 to 20 miles is a good margin to leave; and if a spot between these distances to the south-west of the cape is taken as a point for which to steer when coming from the north-westward, namely, just within the range of Cape Leeuwin light, very little time will be lost in making King George sound. When approaching the coast between Cape Naturaliste and Cape Leeuwin by day, in clear weather, vessels may stand into 30 fathoms (54^{m}9), the bottom being coarse sand mixed with shells and small stones.

Index on pages 349 and 350.

At night.—The greatest caution should be used in running in to make Cape Leeuwin light, with the weather at all thick. The light, powerful as it is, will often not be visible as far as Géographe reef, eight miles to the north-westward; and as mist may hang about the land when it is clear at sea, sounding should never be neglected, and vessels should not stand into less depths than 70 fathoms (128^{m}0).

See also Caution under Route 463.

Route 453. Fremantle to Melbourne, Sydney, or Hobart.

After rounding Cape Leeuwin (*see* Route 452 above), proceed as follows:—

(1) To MELBOURNE OR SYDNEY.—Take a Great Circle track to a position off Cape Otway, and thence proceed as directly as navigation will permit to Port Philip and Melbourne, or to Sydney. (*See* Australia Pilot, Vol. II. and Route 475).

(2) To HOBART.—Take a Great Circle track to a position in lat. 43° 40′ S., long. 146° 00′ E., about 5 miles southward of South West cape. Thence proceed to Hobart as directly as navigation permits, rounding South East cape, and then either through D'Entrecasteaux channel, or round Cape Tasman and through Storm bay. (*See* Australia Pilot, Vol. II).

Distance from Fremantle to Hobart, 1,805 miles; to Melbourne, 1,680 miles; to Sydney, 2,140 miles.

Route 454. Fremantle to Durban and Cape Town

(a) May to September.—Steer on a Rhumb line to lat. 30° 00′ S., long. 100° 00′ E., and thence directly along the parallel of 30° S. to Durban. For the continuation of the voyage to Cape Town *see* Route 319 (a).

(b) October to April.—Steer, as in (a) above, to lat. 30° 00′ S., long. 100° 00′ E., and thence on a Great Circle (reaching its vertex at lat. 35° 00′ S., long. 65° 00′ E.), to Durban, and thence by Route 319 (a) to Cape Town.

CAUTION. *See* Caution under Route 319 (a).

Distance from Fremantle to Cape Town, by (a), 5,220 miles; by (b), 5,140 miles; to Durban, by (a), 4,419 miles; by (b), 4,341 miles.

Route 455. Fremantle to Mauritius or to Mombasa

Take the direct Rhumb line track at all seasons to Mauritius.

For Mombasa, *see* Route 533 (2) (a).

Distance from Fremantle to Mauritius, 3,209 miles; to Mombasa (direct), 4,563 miles; via Mauritius, 4,633 miles.

Route 456. Fremantle to Colombo or Madras

All seasons.—The difference in distance in each case between the Great Circle track and the Rhumb line is inconsiderable (less than 5 miles); but for Madras, the Rhumb line takes a vessel about 100 miles clear to the east of Cocos islands; for Colombo, the Great Circle is preferred, as it leads 60 miles westward of the Group. *See* Route 404 and Route 410. (4)

Distance from Fremantle to Colombo, 3,121 miles; to Madras, 3,389 miles.

Route 457. Fremantle to Aden

(a) Via Colombo.—Take Route 456 to Colombo, and Route 399 on to Aden, (a) to (j), according to time of year, or power of vessel; adding distances as necessary. The shortest of these is 5,215 miles, and the longest 5,617 miles.

(b) Not calling at Colombo.

(i) October to April.—Take a Great Circle track to a position in lat. 4° 00′ S., long. 73° 30′ E., and thence proceed by Rhumb line to round Capo Guardafui; thence continue to Aden, keeping along the African coast as far as Mait island. *See* Caution under Route 399 (c) and Notes at the end of that route.

(ii) May to September.—Take a Great Circle track from Freemantle to lat. 8° 00′ S., long. 68° 00′ E. From this point, steer on a Rhumb line first to 8° 00′ N., long. 52° 40′ E., and thence round Capo Guardafui to Aden. *See* Caution under Route 399 (c), and Notes at the end of that route.

(iii) May to September.—Alternative route.—If preferred, the route eastward and northward of Socotra may be taken from the point lat. 8° 00′ S., long. 68° 00′ E. Steer thence for lat. 8° 00′ N., long. 60° 00′ E., on a Rhumb line; thence for lat. 13° 10′ N., long. 54° 50′ E., and thence to Aden direct. *See* Caution regarding rounding Socotra in Route 399.

Distance from Fremantle to Aden by (b) (i), 4,923 miles; by (b) (ii), 4,980 miles; by (b) (iii), 5,105 miles.

Route 458. Fremantle to Persian gulf, Karāchi, or Bombay

Take Route 456 to Colombo and thence Route 400 to Persian gulf, or Route 401 to Karāchi or Bombay. *See* Persian Gulf Pilot for passages through the Gulf.

Distances from Fremantle (calling at Colombo) are:—

To Bahrein, 5,235 miles; to Bombay, 4,010 miles; to Bushire, 5,295 miles; to Fao, 5,412 miles; to Jāsk, 4,830 miles; to Karāchi, 4,462 miles; to Muscat, 4,717 miles.

Note.—If not calling at Colombo the distances are about 20 miles *less.*

Route 459. Fremantle to Singapore, Rangoon or Calcutta

(a) Via Soenda straat and Singapore.—Take a Rhumb line track direct to Soenda straat, and thence by Banka, Berhala and Doerian straten to Singapore (*See* Notes after Route 310 (b) (v) for alternative routes from Soenda straat to Singapore). From Singapore proceed as directly as navigation permits to Rangoon or Calcutta (*See* Route 435).

(b) Direct Route.—Proceed as directly as navigation permits, on Rhumb line tracks, westward of Sumatra; pass southward of the Nicobar islands to Rangoon, and westward of both Nicobar and Andaman islands to Calcutta. These are shorter than (a) above.

Distance from Fremantle to Calcutta, by (a), 3,829 miles; by (b), 3,684 miles; to Rangoon, by (a), 3,296 miles; by (b), 3,252 miles.

Route 460. Fremantle to ports in Malacca strait and to Mergui

Take Route 459 (a) above to Singapore and thence proceed as directly as navigation permits to destination. (*See* Route 435).

Distances from Fremantle are:—

To Malacca, 2,301 miles; to Mergui, 3,038 miles; to Pangkalan Susu, 2,550 miles; to Penang, 2,555 miles; to Singapore, 2,223 miles; to Soenda straat, 1,697 miles.

Route 461. Fremantle to ports in Macassar strait and Borneo (East coast)

Proceed as directly as navigation permits to Lombok straat (*See* Eastern Archipelago Pilot, Vol II.); thence proceed to destination. *See* Eastern Archipelago Pilot, Vols. II. and I.

Distances from Fremantle are:—

To Balik Papan, 1,915 miles; to Macassar, 1,757 miles; to Sandakan (via Sibutu passage), 2,426 miles; to Lombok straat, 1,445 miles; to Tarakan, 2,249 miles.

Note.—A description of many of the straits mentioned in Routes 459 (a), 460 and 461, will be found in Chapter II. of Section C., Part II.

Route 462.—*Reserved as spare.*

(v) ROUTES FROM ADELAIDE

Route 463. Adelaide to Albany or Fremantle

See Notes for rounding Cape Leeuwin in Route 452.

Steer to Investigator strait to get on the parallel of 35° 30′ S.; follow this parallel westward and (after calling at Albany if desired) round Cape Leeuwin at a distance of about 15 miles, *(See* Notes in Route 452); thence proceed to Fremantle as directly as navigation permits.

CAUTION. *Approaching the coast northward of Cape Leeuwin.*—Between Cape Naturaliste and Rottnest island, by night, or in thick weather, a vessel should not stand into less than 30 fathoms (54^{m}9) until northward of Naturaliste reefs. Thence northward, she may stand into 20 fathoms (36^{m}6) coarse brown sand mixed with shells, and occasionally gravel and small stones. The depth of 20 fathoms (36^{m}6) however, will be found within half a mile of the dangers off Cape Vlaming, Rottnest island; vessels, therefore, bound to the northward of Rottnest island should not go into less than 30 fathoms (54^{m}9) as the island is approached.

Distance from Adelaide to Albany, 1,016 miles; to Fremantle, 1,343 miles.

Route 464. Adelaide to Colombo

(a) Via Fremantle.—Follow Route 463 to Fremantle and Route 456 to Colombo.

CAUTION. *See* Cautions in Routes 452 and 463 for rounding, and passage northward of, Cape Leeuwin.

(b) All seasons.—Direct route.—Steer along the parallel of 35° 30′ to the position 15 miles southward of Cape Leeuwin, and thence on a Great Circle to Point de Galle, Ceylon. Thence proceed as directly as possible to Colombo.

Distance from Adelaide to Colombo by (a), 4,464 miles; by (b), 4,364 miles.

Routes 465. Adelaide to Aden

(a) Via Fremantle.—Follow Route 463 to Fremantle and thence take Route 457 (a), via Colombo, or Route 457 (b) (i), (ii) or (iii), direct to Aden.

(b) Direct route.—All seasons.—Follow Route 463 to the position 15′ southward of Cape Leeuwin. Thence proceed on a Great Circle to lat. 8° 00′ S., long. 68° 00′ E. Thence continue either southward or northward of Socotra, as described in Route 457 (b) (ii), or 457 (b) (iii) respectively. *See* Note below Route 471 (b).

Distance from Adelaide to Aden by (a) may be found by adding the distances of the two or three parts, according to route. The shortest is 6,266 miles; the longest, 6,960 miles.

Distance by (b) and 457 (b) (ii), 6,165 miles; 457 (b) (iii), 6,290 miles.

Route 466. Adelaide to Durban or Cape Town

Proceed to a position about 15 miles southward of Cape Leeuwin (*See* Route 463) and thence steer to a position in lat. 30° 00′ S., long. 100° 00′ E., to join Route 454 (a) or (b), according to season.

Distance from Adelaide to Durban, using 454 (a), 5,579 miles; using 454 (b), 5,501 miles; to Cape Town, using 454 (a), 6,380 miles; using 454 (b), 6,300 miles.

If a call is made at Fremantle the above distances are increased by 180 miles.

Route 467. Adelaide to Persian gulf, Bombay, Karāchi, Bay of Bengal or Singapore

(1) To PERSIAN GULF, BOMBAY OR KARĀCHI.—Proceed to Colombo by Route 464 (a), or (b), and thence by Route 400 or 401. The *distance* to the various ports in the Persian gulf or to Bombay or Karāchi is the sum of that given in the appropriate Routes above.

(2) To BAY OF BENGAL OR SINGAPORE.—Take Route 463 to Fremantle and thence Route 459 to Rangoon or Calcutta, or Route 460 to ports in Malacca strait, Mergui, and Singapore.

Distances are the sum of the distances given in the routes above to the various ports.

Route 468. Adelaide to Melbourne, Hobart or Sydney (*See* also Route 475).

In each case the route is by Backstairs passage, and thence as direct as navigation permits.

CAUTION. With southerly or westerly winds a current setting on to the land at a rate of one knot is sometimes experienced between Cape Willoughby and Cape Otway. To the southward of Cape Jaffa, a current sets to the eastward at about one knot during westerly gales; and at the same time, near Cape Jaffa the current runs to the northward.

Between Rivoli bay and Cape Northumberland, do not shoal the water to less than 25 fathoms (45^{m}7) at night; this depth is found, on the average, at rather more than 5 miles off shore.

Distance from Adelaide to Hobart, 756 miles; to Melbourne (Port), 514 miles; to Sydney, 973 miles.

(vi) ROUTES FROM MELBOURNE

Distances are calculated from Port Melbourne.

Route 469. Melbourne to Adelaide

After clearing Port Phillip join Route 497 (2) off Cape Otway.

Distance from Melbourne to Adelaide, 514 miles.

Route 470. Melbourne to Albany or Fremantle

See Caution in Route 452 for rounding Cape Leeuwin, and under Route 463.

First proceed to a position off Cape Otway, and from thence take a Great Circle track to a position about 15 miles south of Cape Leeuwin; thence continue round Cape Leeuwin to Fremantle as directly as navigation permits. If calling at Albany, leave the Great Circle when south-eastward of that port, and proceed thence direct.

Distance from Melbourne to Albany, 1,359 miles; to Fremantle, 1,680 miles.

Route 471. Melbourne to Colombo or Aden

See Route 452 for Notes for rounding Cape Leeuwin.

(a) Via Fremantle.—Take Route 470 to Fremantle and thence Route 456 to Colombo; or Route 457 (a) (via Colombo), or Route 457 (b) (Direct), to Aden.

(b) Direct route.—Proceed as in Route 470 to a position about 15 miles southward of Cape Leeuwin; thence, if bound to Aden, take a Great Circle track to lat. 8° 00′ S., long. 68° 00′ E. Thence proceed either southward, or northward,of Socotra to Aden as described in Route 457 (b) (ii), or 457 (b) (iii) respectively. If bound to Colombo, take a Great Circle direct to Point de Galle from Cape Leeuwin and thence to Colombo.

Note.—The direct Great Circle track from Cape Leeuwin to Cape Guardafui passes through the Chagos archipelago.

Distances from Melbourne are:—

To Aden.—By (a), the addition of the distances of the two or three parts, according to route. The shortest, via Colombo, is 6,895 miles, and the longest 7,297 miles.

Via Fremantle on the direct route (457 (b) (i)) the distance is 6,603 miles. By (b) and 457 (b) (ii), 6,500 miles; by 457 (b) (iii), 6,625 miles.

To Colombo.—By (a), 4,801 miles; by (b), 4,705 miles.

Route 472. Melbourne to Durban or Cape Town

First take Route 470 to a position about 15 miles southward of Cape Leeuwin, and thence steer to a position in lat. 30° 00′ S., long. 100° 00′ E., to join Route 454 (a), or (b), according to season.

Distance from Melbourne to Durban, by 454 (a), 5,915 miles; by 454 (b), 5,837 miles; to Cape Town, by 454 (a), 6,716 miles; by 454 (b), 6,636 miles.

If a call is made at Fremantle the above distances are increased by 180 miles.

Route 473. Melbourne to Persian gulf, Bombay, Karāchi, Bay of Bengal or Singapore

(1) To PERSIAN GULF, BOMBAY OR KARĀCHI.—Proceed to Colombo by Route 471 (a) or (b) above, and thence by Route 400 or 401.

(2) To BAY OF BENGAL OR SINGAPORE.—Take Route 470 to Fremantle, and thence Route 459 to Rangoon or Calcutta, or Route 460 to ports in Malacca strait, Mergui or Singapore.

Distances are the sum of the distances in the routes above to the various ports.

Route 474. Melbourne to Hobart

The passage may be made either eastward or westward of Tasmania.

(a) Eastward route.—The eastward passage may be taken either through Bass strait, and outside the Furneaux group, or direct through Banks strait, as desired. The Banks strait route is about 25 to 30 miles shorter than the Bass strait route.

(b) Westward route.—The westward route is usually made to the westward of King island. The strait between King island and Tasmania is not recommended; and by taking it the distance is shortened only by 12 miles.

Distance from Melbourne to Hobart by (a) (Bass strait), 495 miles; by (a) (Banks strait), 470 miles; by (b) (West of King island), 486 miles.

Route 475. Melbourne to Sydney

After clearing Port Phillip, steer through Bass strait, so as to pass about 2 miles south of the Anser islands, 3 miles north of Rodondo, and 2 miles south of South East point, Wilson promontory. Then steer to pass about 5 miles south-eastward of Rame head and Gabo island.

CAUTION. Occasionally, and especially during and after easterly gales, the current sets strongly towards the land. In thick weather, sounding must not be neglected.

From a position east of Cape Howe, steer to the northward along the land to Port Jackson, in fine weather at a distance of about 2 miles, passing inside Montagu island, to avoid the southerly set of the current.

Distance from Melbourne to Sydney, 582 miles.

For Routes from Melbourne to New Zealand, and to ports and islands in the Pacific ocean, *see* Section B., Part IV., Chapter II.

Route 476.—*Reserved as spare.*

(vii) ROUTES FROM HOBART

Route 477. Hobart to Albany or Fremantle

After rounding the Friar rocks and South Cape of Tasmania at a distance of from three to five miles, steer to pass six miles south-west of the Mewstone (off Maatsuyker island lighthouse); and from thence take the Great Circle track to King George's sound (for Albany), or so as to pass 15 miles off Cape Leeuwin, if bound to Fremantle. From these positions, steer as directly as navigation permits, to destination.

See Caution in Route 452 and Route 463.

Distance from Hobart to Albany, 1,490 miles; to Fremantle, 1,806 miles.

Route 478. Hobart to Colombo or Aden

(a) Via Fremantle.—Take Route 477 to Fremantle, and thence Route 456 to Colombo, or Route 457 (b) (via Colombo), or Route 457 (b) (Direct), to Aden.

(b) Direct route.—Proceed as in Route 477 to Cape Leeuwin, and thence as in Route 471 (b).

Distances from Hobart are:—

To Aden.—By (a).—The addition of the distance of the two or three parts according to route. The shortest via Colombo is 7,021 miles, and the longest 7,423 miles. Using Route 457 (b) (i) from Fremantle, the distance is 6,729 miles. By (b) and 457 (b) (ii), 6,631 miles; by (b) and 457 (b) (iii), 6,753 miles.

To Colombo.—By (1), 4,927 miles; by (2), 4,830 miles.

Route 479. Hobart to Durban or Cape Town

Take Route 477 to a position about 15 miles southward of Cape Leeuwin and thence steer to a position in lat. 30° 00′ S., long. 100° 00′ E. to join Route 454 (a) or (b), according to season.

Distance from Hobart to Durban, using 454 (a), 6,039 miles; using 454 (b), 5,961 miles; to Cape Town, using 454 (a), 6,840 miles; using 454 (b), 6,760 miles.

If a call is made at Fremantle the above distances are increased by 180 miles.

If a Great Circle track is taken from the Mewstone direct to lat. 30° 00′ S., long. 100° 00′ E., the distance is decreased by only 23 miles, and the adverse wind and head sea likely to be experienced will be heavier.

Route 480. Hobart to Persian gulf, Bombay, Karāchi, Bay of Bengal or Singapore

(1) To PERSIAN GULF, BOMBAY OR KARĀCHI.—Proceed to Colombo by Route 478 (a) or (b) above, and thence by Route 400 or Route 401.

(2) To BAY OF BENGAL OR SINGAPORE.—Take Route 477 to Fremantle and thence Route 459 to Rangoon or Calcutta, or Route 460 to ports in Malacca strait, Mergui or Singapore.

Distances are the sum of the distances in the Routes above to the various ports.

Route 481. Hobart to Adelaide

Round the south of Tasmania, as described in Route 477, and from thence steer a direct course for Cape Willoughby and the Backstairs passage *(see* Australia Pilot, Vol. I.). Thence proceed as directly as navigation permits. *See* Caution in Route 468.

Distance from Hobart to Adelaide, 756 miles.

Route 482. Hobart to Melbourne

See Route 474 as to choice of routes, either eastward, or westward, of Tasmania.

(a) Eastward route.—Steer to round Cape Pillar and Tasman island at one mile distant (if weather is clear) and thence follow the coast to the northward,

but not closing it within five miles; thence pass through Banks strait or Bass strait and thence direct to Port Philip. *See* Australia Pilot, Vol. II.

(b) Westward route.—Steer to round the southern end of Tasmania at a distance of from three to five miles, passing at about six miles southward of the Mewstone *(see* Route 477). When clear of South West cape, lay a direct course so as to pass not less than 10 miles westward of King island, and at twice that distance in thick weather. After passing Harbinger rocks, steer direct for Port Phillip.

See Australia Pilot, Vol. II., and especially the Caution respecting currents to south-eastward in the vicinity of King island; this caution is also engraved on the chart.

Distance from Hobart to Melbourne:—

(a) Eastward of Tasmania; by Banks strait, 470 miles; by Bass strait, 495 miles.

(b) Westward of Tasmania, 486 miles.

Route 483. Hobart to Sydney

Round Cape Pillar and Tasman island at one mile distance (if weather is fine), and then make a direct course for Cape Howe, but not closing the coast of Tasmania within five miles. From a position east of Cape Howe, steer to the northward along the land to Port Jackson, in fine weather at a distance of about 2 miles, and passing inside Montagu island, in order to avoid the southerly set of current.

Distance, Hobart to Sydney, 635 miles.

Route 484.—*Reserved as spare.*

For Routes from Hobart to New Zealand and to ports and islands in the *Pacific ocean, see* Section B, Part IV., Chapter II.

Routes from Sydney and Brisbane to ports in the *Indian ocean* are given in Section B., Part IV., Chapter II.

Routes from Sydney, Brisbane and Wellington to *Bishop rock*, east-about and west-about are given in Section B, Part IV., Chapter II.

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PART IV PACIFIC OCEAN

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SECTION B. PART IV.

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WINDS AND WEATHER

GENERAL REMARKS

The following description of the winds and weather of the Pacific ocean amplifies the general statement given in Section A. For more precise information regarding oceanic winds and weather, the mariner is referred to the atlases of Monthly Meteorological Charts of the eastern and western Pacific ocean (M.O.M. 446 and M.O.M. 422 respectively), published by the Marine Branch of the Meteorological Office, Air Ministry. Detailed information relating to specific localities should be sought in the appropriate volumes of the Admiralty Sailing Directions.

In reading the following description reference should be made to the World Climatic Charts 5301 and 5302, which will be found in the pocket at the end of this book.

In the eastern part of the Pacific ocean, the winds and weather conform, in the main, to the general description of oceanic winds and weather given in Section A. In the western part of the ocean however, the seasonal heating and cooling of the great Asiatic land mass results in the establishment here of a monsoonal regime. Conditions are further complicated, in the region between northern Australia and the Philippines, by the large number of islands; many of these are of considerable size and height, and cause marked differences in the winds and weather experienced in different localities. No attempt will be made here to describe these local effects, for information concerning which reference should be made to the appropriate volume of the Admiralty Sailing Directions.

NORTH PACIFIC OCEAN

The Doldrums

East of about longitude 160° W., the Doldrum belt remains north of the equator throughout the year. West of the above meridian, however, it is situated in the southern hemisphere from about November or December until April or May; in the northern summer the Doldrums are virtually non-existent west of about longitude 150° E., where they merge into the northward—flowing airstream of the South-West Monsoon *(see* below). In the Western North Pacific therefore, the Doldrum belt is really only in evidence during the change of the monsoons, from about mid-September to mid-November, and from about mid-April to mid-May. The weather of the Doldrums is that typical of the belt in other oceans, viz., light variable winds and calm alternating with squalls, heavy showers, and thunderstorms; westward of about longitude 130° W. however, the frequency of calms and variables is considerably less than in the Doldrums of other oceans, and the majority of winds are from an easterly point. The mean positions of the belt in February and August, in which months it reaches its extreme southerly and northerly positions respectively, is indicated on climatic charts 5301 and 5302. The actual position, however, is subject to considerable day to day variation, as also is the width of the zone, which averages about 150 miles. The worst weather is generally experienced on occasions when the Trade winds of the two hemispheres meet at a wide angle.

Visibility is always good except when reduced by heavy rain.

Seasonal Winds of the Eastern North Pacific

In the summer months, east of about longitude 120° W., and between the Doldrums and the equator, there exists an area covered by prevailingly south-westerly winds *(see* Climatic Chart 5302). These winds are of a monsoonal nature, and result from the summer heating of the North American continent giving rise to a lowering of pressure over that area, and the consequent distortion of the equatorial trough of low pressure (in which is situated the Doldrums) towards the north; the South-East Trade wind of the South Pacific ocean is drawn across the equator, is deflected to the right by the effect of the earth's rotation, and is felt as a south-westerly wind in the area under consideration.

Over the greater part of the area these winds prevail from about June to October, and replace the North-East Trade winds which prevail there in the winter months *(see* below). The length of the season of these south-westerlies varies with latitude, being longest near the equator, in the vicinity of which south to south-west winds are prevalent in most months east of the 100th meridian.

Winds are mostly light or moderate in strength, though squalls, during which wind may occasionally reach gale force, are rather common, and tropical storms *(see* below) may also produce high winds and gales at times.

Weather is generally cloudy and unsettled, and rainfall is considerable; it is in fact these winds which bring the rainy season to much of Mexico and Central America.

Visibility in the open ocean is almost always good except when reduced by rain.

The North-East Trade wind

This wind forms the equatorial side of the great clockwise circulation around the oceanic high pressure area situated in about latitude 30° N. This " high " is situated further north and is somewhat more intense in the summer than in the winter, and while in the former season, it generally consists of a single cell, in the latter it more often represents the resultant of a succession of anticyclones moving eastward across the North Pacific from Asia, and becoming stationary in the eastern part of ocean.

In the summer the Trade wind blows eastward of about longitude 150° E., and between the Doldrums and about latitude 32° N.; the limits are not however fixed, but fluctuate considerably. West of long. 150° E. the Trade gives way to the South-West Monsoon of the Western North Pacific, which is described below.

In the winter months the North-East Trade extends from latitude 20°-25° N. to the Doldrums where the latter are in the northern hemisphere, while west of about longitude 170° W., the southern limit is the equator. In the western part of the zone, the trades merge with the North-East Monsoon of the Western North Pacific, which is described below.

As with the Trade winds of other oceans, these winds are remarkable over large areas for their persistence and steadiness. The general direction and steadiness of the wind in different parts of the zone can best be seen from a study of world Climatic Charts 5301 and 5302; from these it will be seen that the direction becomes more northerly (or even north-westerly) near the American coast, and mainly easterly, in the summer months, in the south-western part of the area covered by these winds.

The strength of the North-East Trade averages Beaufort force 3–4, but it often freshens to force 5–6 over large areas. Winds are likely to reach force 7 or above on 0–3 days per month in the heart of the trades; in the vicinity of the Mexican coast, north of about latitude 10° N. and between about longitude 90° W. and 100° W. however, the frequency rises to 3–6 days per month from November to February, while, apart from squalls, winds of this strength are unlikely within about ten degrees of the equator.

The typical weather of the Trade wind zone is fair with scattered showers, and skies about half covered with small cumulus clouds. At times the trade becomes unsteady, and is followed by a day or two of unsettled showery weather with occasional squalls. In the north-eastern part of the zone, towards the American coast, cloud amounts are generally smaller than elsewhere, and rain is rare.

Visibility in the open ocean is generally good except when reduced by rain, but there is often a light haze which restricts visibility to between about 8 and 15 miles; showers, cloud and haze usually increase when the wind freshens. Dust haze is sometimes prevalent off the American coast and is associated with fresh or strong off-shore winds.

The North-East Monsoon *(September/November–April)*.

In the northern winter, the cooling of the great Asiatic land mass results in the establishment of an intense area of high pressure over Mongolia and Eastern Siberia. The anticyclonic wind circulation resulting from this pressure distribution gives rise to the establishment, at this season, of north-easterly winds over the western part of the North Pacific south of about latitude 30° N., and in the China and Yellow seas. The northern and eastern limits of the area covered by the monsoon are not very well defined; eastward it merges with the North-East Trade wind of the eastern and central North Pacific, while northward it gives way to the prevailing westerlies of higher latitudes.

The general direction and steadiness of the monsoon is indicated on Climatic Chart 5301; at the height of the season, in January, winds in the open waters of the south China sea and eastward of the Philippines are almost exclusively from between north and east, while in the Yellow sea the direction becomes more northerly, and over southern Japan is north-westerly. The frequency of winds from directions other than the prevailing one becomes greater with increasing latitude; the monsoon also becomes less steady, lighter, and more northerly towards the equator and among the islands of the Sulu and Celebes seas.

The time of onset of the monsoon varies with latitude; in the north it begins about September, while towards the equator it does not become established until November. In April it becomes less steady, the prevailing direction becomes more easterly, and winds with a southerly component are more frequent.

The strength of the wind in the open sea averages about Beaufort force 5 in the north, rising to 6 in the Formosa strait, and decreases to force 4 south of about latitude 10° N. North of about latitude 25° N. the strength varies within wide limits due to the travel of depressions or lows *(See* Section A) from the vicinity of Eastern China towards Japan and the Aleutian islands. As far east as about the longitude of Japan, there is frequently no closed wind circulation around these newly-formed lows; their passage is marked by a slackening of the monsoon ahead of them, and a freshening—often to gale force—in their rear. At the height of the season in December and January, winds are likely to reach Beaufort force 7 or above on 6-10 days per month over much of the area between Indo-China, the Northern Philippines, Formosa and Japan, as indicated by the buff-tinted area on Climatic Chart 5301; the stormiest area is to the eastward of the Northern Philippines and Formosa, where winds of this strength are likely on over 11 days per month. In the Yellow sea their frequency is about 3–6 days per month, while south of the tenth parallel it decreases to 1–3 days per month or less.

North of about latitude 20° N. overcast skies with periods of light rain or drizzle are typical during this season—especially from January to April, though at times there are periods of more broken skies, and in October and November generally fair conditions prevail along the South East China coast. In the gulfs of Pohai and Liaotung in the extreme north, immediately to leeward of the Asiatic land mass, a good deal of fine settled weather with only small amounts of cloud prevails. South of about latitude 17° N., in the open sea skies are mostly about half covered, and there are occasional showers; cloudiness increases again towards the equator and showers become more frequent.

The weather in the vicinity of land is greatly affected by the exposure to the prevailing monsoon; where the latter blows ashore, and especially when the coast is backed by high ground, cloud amounts are larger and rainfall heavier than in the open sea, while to leeward of high ground fairer conditions prevail. Information relating to specific localities must therefore be sought in the appropriate volume of the Admiralty Sailing Directions.

In the open ocean visibility is good except when reduced by rain. Off the coasts of China and Indo-China however, poor visibility becomes increasingly frequent after December, and mist or fog probably occurs on over 10 days per month in the vicinity of northern Indo-China in February and March, and on 8-9 days per month off Hong Kong in March and April. In the gulfs of Pohai and Liaotung, strong north-westerly winds at times bring dust haze from the interior of Mongolia.

The South-West Monsoon *(May/June–August/September)*.

In the northern summer, the intense heating of the Asiatic land mass results in the formation of an area of low pressure centred approximately over North West India with an extension over Eastern Asia *(See* Climatic Chart 5302). The South-East Trade wind of the South Pacific and Indian oceans is drawn across the equator, is deflected to the right by the effect of the earth's rotation, and is felt in the Western North Pacific, China and Yellow seas as a prevailingly south to south-west wind known as the South-West Monsoon. The northern and eastern limits of the monsoon are ill-defined, but at the height of the season (July) winds are predominantly from between south-east and south-west, west of about longitude 140° E. and south of about latitude 40° N. The general direction and steadiness of the winds at this period are indicated on Climatic Chart 5302. The monsoon is steadiest in the South China sea, in which area the great majority of winds are from between south and west; further north and east they are much more variable in direction, and in the early part of the season north of about 25° N., travelling depressions may cause winds from any direction; along the China coast between latitudes 20° N. and 30° N. and in the vicinity of Formosa, north-easterlies are still more common than south-westerlies in May.

The average strength of the monsoon in the open sea is about Beaufort force 3–4 in the South China sea, and force 3 elsewhere, but squalls, during which winds may occasionally reach gale force, are rather common. Apart from these squalls, or in association with tropical storms *(see* below), winds do not often reach force 7 at this season. Land and sea breezes (*see* Section A) prevail close to the coast, and calms are not uncommon.

Weather over the open sea away from the effects of land is mainly fair, with skies about half covered, and with occasional showers. Over the coasts however, especially if exposed to the monsoon and backed by high ground, cloudy weather with frequent heavy rain prevails.

Visibility over the open ocean is good except when reduced by rain, but along the China coast there is a high frequency of sea fog (*see* Section A) in certain months, due to the northward spread of warm moist equatorial air over water the temperature of which has been reduced to low values (for the latitude), by the persistent north-east winds of the winter monsoon. The water recovers its more appropriate temperature progressively from south to north, and the foggy season reaches its maximum in April off Hong Kong (8-9 days per month), in June off the Yangtse (12 days), and in July off southern Shantung (12 days). After these months the incidence decreases sharply to about 2 days per month, and fog is rare in the latter part of the season.

The Variables

In a belt extending across the central part of the ocean, and situated in about latitude 25°–30° N. in winter, and 35°–40° N. in the summer, there are variable and mainly light or moderate winds in the vicinity of the oceanic anticyclone. In the eastern part of this zone winds are predominantly northerly at all seasons, and form a northward extension of the North-East Trade wind around the eastern flank of the oceanic " high "; in the western part of the zone in summer winds become mainly southerly, and merge with the South-West Monsoon described above, while in the winter months they give way, west of about longitude 150° E., to prevailingly north-westerly winds forming part of the circulation of the North-East Monsoon.

In summer winds are generally light, and are likely to reach Beaufort force 7 only on rare occasions except in association with tropical storms (*see* below), and east of about longtitude 140° W. where they may be expected to reach this strength on 1–4 days per month—the higher figure applying towards the American coast, in the vicinity of which strong north to north-west winds are common. At the height of the winter season in January, winds may be expected to reach force 7 or above on 1–3 days per month east of about longitude 140° W., and on 3–6 days per month west of the above meridian, increasing to 6–10 days per month in the area covered by the North-East Monsoon west of about longitude 150° E. and already described.

Weather in the summer months is generally fair or fine near the normal position of the oceanic " high " (*see* Climatic Chart 5302), which, at this season, usually consists of a single cell, and rain is infrequent. Eastward, towards the American coast, cloudier conditions prevail, but rainfall is scanty. Cloud amounts also increase westward, and rain is more common. In winter the " high " shown on Climatic Chart 5301 usually consists of a series of eastward-moving anticyclones, in the vicinity of which fair or fine weather prevails, the intervening troughs of relatively low pressure being characterised by cloudy, showery weather.

Visibility in winter is mostly good except when reduced by rain, and in the open ocean fog is uncommon. In summer poor visibility and fog become increasingly frequent towards the northern limit of the zone (40° N. at this season); in the west this is due to the northward flow of warm moist equatorial air over progressively colder water, aggravated off the east coast of Northern Honshu by contact with the cold Oya shio current; in the east it is due to a similar cooling by the California current. Over much of the zone fog probably occurs on 3–4 days per month at this season, rising to 5–7 days per month off the east coast of Northern Honshu, and 5–10 days per month off the coast of California.

The Westerlies

On the polar side of the oceanic high, the prevailing winds are from some westerly point, but summer and winter conditions are markedly different, and it is convenient to treat the two periods separately.

In winter, the almost continuous passage of depressions or " lows " from the vicinity of China and Japan in a north-easterly direction towards the Aleutian Islands and Southern Alaska, causes winds to vary greatly both in direction and strength, and winds from any direction may be experienced. The usually steep pressure gradient associated with these lows causes a high frequency of strong winds and gales, as is shown by the buff-tinted area in Climatic Chart 5301. The region of highest gale frequency extends from eastward of Japan to the southward of the Aleutians and the Alaska peninsula; in this region winds are likely to reach Beaufort force 7 or above on 12–18 days per month.

The main feature of the weather is its great variability, periods of overcast skies and rain or snow alternating with fairer intervals. Fine weather is however, seldom prolonged, and cloud amounts are generally large. Although fog is not common at this season, rain and snow often seriously reduce visibility; it is also often only moderate with winds from a southerly point, but is generally good (except in precipitation) with northerly or north-westerly winds.

In summer, depressions are less frequent, much less intense, and their tracks are further north than in winter. Winds therefore, although they still vary a good deal both in direction and strength, are much lighter, and gales are far less common. Over the greater part of the zone, winds probably reach Beaufort force 7 or above on 1–5 days per month south of about latitude 50° N.; the quietest month is July, during which winds of this strength are unlikely on more than one day on the average. North of the fiftieth parallel observations are sparse, but the frequency of gales probably does not differ greatly from the above figures.

Over the greater part of the zone weather is very cloudy and foggy; west of about longitude 160° W. fog occurs on 5–10 days per month in most parts, rising to over 10 days per month over large areas (*see* Climatic Chart 5302). This high incidence is due to the northward flow of warm moist south to south-west winds over progressively colder water—and in particular over the cold waters of the Oya shio or Kamchatka current. East of longitude 160° W. the frequency is less but it increases again to 5–10 days per month towards the west coast of America over the cold waters of the California current.

The Polar Easterlies

Since in the winter months, the tracks of the majority of depressions are somewhat to the south of the Aleutian islands, winds in the Bering sea at this season are prevailingly easterly. As in the case of the westerlies, great variations both in direction and strength occur, due to the passage of depressions close to, or across, the area. The northern part of the zone is unnavigable on account of ice; in the southern part winds probably reach Beaufort force 7 or more on over 10 days per month.

Weather is generally very cloudy, and precipitation (usually in the form of snow), is frequent, amounts being greatest in the south. Visibility is often poor on account of snow.

Tropical storms

In the Western North Pacific these storms are known as Typhoons, and in the Eastern North Pacific as Hurricanes. A description of tropical storms is given in Section A, together with warning signs of their presence, and the action recommended to ships menaced by them.

Typhoons

The area mainly affected by these storms is to the west and north of the Caroline and Marianas islands, and includes the Northern Philippines, the northern half of the South China sea, the vicinity of the China coast and Formosa, the Eastern sea and Japan.

Although typhoons may occur in any month, more than half are experienced from July to October, and nearly 90% between May and December inclusive; September is the month of greatest frequency with an average of just over 4 storms; the actual number experienced in any month however, varies greatly in different years.

Notwithstanding the fact that, taking the area as a whole, no month is immune, some parts of it are free from typhoons in certain months; the most important of these are the China coast, Formosa strait, and western part of the Eastern sea, in which areas they have not been recorded from December to April.

More detailed information regarding storm frequencies in specific localities and in different months will be found in the Admiralty Sailing Directions, and in the atlas of Monthly Meteorological Charts of the Western Pacific (M.O.M. 422) referred to at the head of this section.

Hurricanes

The area mainly affected is the vicinity of the Pacific coast of America between about latitudes 10° N. and 30° N.; they have however, been recorded as far west as longitude 130° W.–140° W., generally in the early part of the season.

The very great majority of these hurricanes occur from June to October, the month of greatest frequency being September with an average of two storms; they are occasionally recorded in May and November, and one has occurred in December; they are unknown from January to April. As with all tropical storms, the number experienced in different years varies greatly.

More detailed information regarding storm frequencies in different localities will be found in the Admiralty Sailing Directions, and in the atlas of Monthly Meteorological Charts of the Eastern Pacific (M.O.M. 446) referred to at the beginning of this chapter.

SOUTH PACIFIC OCEAN

The Doldrums

As already stated, the Doldrum belt remains north of the equator throughout the year east of about longitude 160° W.; west of this meridian it is situated in the southern hemisphere from about November or December to April or May, reaching its extreme southerly position in February *(see* Climatic Chart 5301). The seasonal movement of the belt in the Western South Pacific is thus large, as also is the day to day variation in its position—especially in the extreme west in the vicinity of Northern Australia and New Guinea. The width of the zone averages about 150 miles, but it may at times be as little as 50 miles and at others over 300 miles.

Weather is that typical of the Doldrums elsewhere, viz., calms and light variable winds alternating with squalls, heavy rain (most often in the form of showers), and thunderstorms. Conditions are generally more severe in the Western South Pacific than elsewhere in this ocean, due to the wide angle at which the South-East Trade wind and the North-West Monsoon *(see* below) meet.

As always in the Doldrums, visibility in the open sea is good except when reduced by heavy rain.

The North-West Monsoon *(December to March).*

During the southern summer, pressure is low over the northern part of the heated Australian land mass, and the equatorial trough of low pressure (in which is situated the Doldrums) is located over that area. The North-East Monsoon of the Western North Pacific is drawn across the equator, is deflected to the left by the earth's rotation, and is felt over the South Pacific west of about the 180th meridian and between the equator and the Doldrums as a prevailingly north-westerly wind known as the North-West Monsoon. The season of this monsoon varies somewhat with latitude; in the vicinity of Northern Australia it is generally only firmly established in January and February, while further north in the Soenda and Banda seas it normally blows from December to March.

The general wind direction is indicated on Climatic Chart 5301; winds are mainly from between north-west and north-east in the vicinity of the equator, and back gradually to between north-west and west with increasing latitude. Over much of the area the constancy of the monsoon is not great, and winds from other directions are also experienced, though at the height of the season and away from the effects of land, winds from between south and east are uncommon; in the vicinity of the numerous islands, local effects may cause variation in both the direction and force of the wind.

The strength of the monsoon is generally only light or moderate, but squalls during which the wind may sometimes reach gale force, are rather common; apart from these, or in association with tropical storms *(see* below), winds of this strength are unlikely.

Weather is generally cloudy, and rain, usually in the form of heavy showers, is frequent over most of the area. In the vicinity of land, the weather often varies greatly over short distances; off coasts exposed to the monsoon—especially if backed by high ground, rainfall is often very heavy and cloud amounts are large, while off sheltered coasts fairer and less cloudy conditions prevail. Information relating to specific localities should therefore be sought in the appropriate volume of the Admiralty Sailing Directions.

Visibility in the open sea is always good except in heavy rain, which may however, reduce it temporarily to less than 2 cables.

The South-East Trade Winds

This wind forms the equatorial side of the anticyclonic wind circulation around the oceanic high pressure area situated in about latitude 30° S. In the eastern part of the zone the trade winds are maintained by the semi-permanent anticyclone situated towards the eastern side of the ocean and shown on Climatic Charts 5301 and 5302, while in the west they are due to migratory " highs " moving eastward from the vicinity of Australia.

Over the greater part of the ocean, the northern limit of the trades is defined by the belt of the Doldrums. In the southern winter however, east of about longitude 120° W. and west of about longitude 140° E, the northern limit is the equator, north of which the trades recurve to form the south-westerlies of the Eastern North Pacific, and the South-West Monsoon respectively; these winds are described above among those of the North Pacific ocean. The southern limit of the trade winds is situated in latitude 15° S.–

20° S. in winter, and in about 20°–25° S. in the summer months.

As with the trade winds of other oceans, those of the South Pacific are remarkable over large areas for their persistence and steadiness. The general direction and constancy of the wind can best be seen from a study of World Climatic Charts 5301 and 5302. In the vicinity of the west coast of South America the trades blow from between south and south-east, while further west the direction becomes predominantly easterly; it becomes south-easterly again in the winter months west of about longitude 160° E., and over the seas to the north of Australia; in these areas it is sometimes known as the South-East Monsoon in contradiction to the North-West Monsoon which prevails here in summer, and which has been described previously. West of about longitude 140° W. from November to April, the Trade wind is unsteady over large areas, and though the predominant direction remains from between north-east and south-east, winds from other directions are rather frequent.

The average strength of the Trade is about Beaufort force 4, but it often freshens to force 5 or 6 over large areas. Over the greater part of the Trade wind zone, winds of force 7 or above are unlikely on more than 1 or 2 days per month and, apart from short-lived squalls, are rare within 10 degrees of the Equator. In an area between the north-east coast of Queensland, New Caledonia and the New Hebrides, however, the frequency of these winds rises to 3–6 days per month over much of the year.

In the open ocean the characteristic weather of the steady South-East Trade wind is fair with occasional showers; skies are about half covered with small cumulus clouds, and there is a slight haze which reduces visibility to between about 8 and 15 miles. Showers, cloud and haze generally increase when the wind freshens. East of about the 180th meridian, and between the Equator and about latitude 8° S.—but varying somewhat with the season —there is a belt in which rainfall is generally scanty, and cloud amounts are relatively small. This dry belt widens towards the coast of South America to include most of the area covered by the Trade wind; weather here is however, cloudier, and overcast skies are common.

From November to April, west of about longitude 140° W., but excluding the dry belt mentioned above, weather is often unsettled; the Trade becomes unsteady, and is followed by a period of cloudy, showery weather before settling in again with increased strength and some squalls from between south and east.

Over the seas to the north-westward of Australia, during the season when the South-East Trade wind prevails in these regions (*i.e.* April to September or October) cloud amounts are small and rainfall is scanty; extensive dust haze prevails, especially towards the end of the season, due to the persistent off-shore winds from the increasingly dry interior of the continent. These conditions are most marked in the Timor sea, but are also prevalent in the Java, Soenda and Banda seas, and to a lesser extent in the Arafura sea. Visibility in the hazy area is often less than 5 miles. Fog and mist are rather common towards the coast of South America over the cold waters of the Humboldt or Peru current, but rarely occur elsewhere.

The Variables

Between the southern limit of the South-East Trade wind and the northern limit of the westerlies, there exists a wide belt of variable winds of mainly moderate strength; the approximate area covered by this belt extends from latitude 25° S. to 40° S. in summer, and from latitude 20° S. to 30° S. in winter. It does not however, extend completely across the ocean; east of about longitude 85° W., south to south-east winds prevail, forming a southward extension of the South-East Trade wind around the eastern flank of the oceanic " high."

Except in the eastern part of the zone referred to above, winds vary considerably in strength as well as in direction, and in general, strong winds become more frequent with increasing latitude. Over the greater part of the area winds are likely to reach Beaufort force 7 or above on 1–3 days per month, rising to 3–6 days per month towards the southern limits of the zone. This latter frequency is also reached in many months over large areas west of about longitude 160° W.

Weather is variable, being governed largely by the eastward-moving anticyclones already referred to; near the centres of these highs it is fair or fine, while the intervening troughs of low pressure are characterised by cloudy unsettled weather, with rainfall increasing towards the south. East of longitude 85°–90° W. rainfall becomes progressively smaller towards the north and east, and it is very infrequent in the vicinity of the American coast. In this area however, cloud amounts are often large, and overcast skies are common in the winter months.

Visibility is generally good in the northern part of the zone except when reduced by rain, but the frequency of moderate or poor visibility increases with latitude and towards the southern limits (*i.e.*, latitude 40° S. in summer and 30° S. in winter), visibility of under 5 miles is recorded in some 10%–15% of ships' observations in summer, and 5% in winter. It is generally associated with winds from some northerly point.

In the extreme east, over the cold waters of the Humboldt current, fog is rather prevalent, and off the west coast of South America occurs on 3–5 days per month towards the southern limits of the zone.

The Westerlies (Roaring Forties)

South of the belt of high pressure described in the preceding paragraphs westerly winds predominate. As in the zone of the westerlies in other oceans however, the almost continuous passage of lows from a westerly towards an easterly point causes the winds to vary greatly both in direction and strength. Gales are very prevalent, especially in the winter, during which season winds are likely to reach force 7 or above on 5–10 days per month over most of the area between latitudes 30° S. and 40° S., and on more than 12 days per month over a great part of region south of the 40th parallel; one of the stormiest areas is to the west and north-west of Cape Horn, in which region winds of this strength are likely on about 20 days per month from July to September.

In the summer gales are somewhat less common, and the gale area is further south. East of about longitude 150° W., and between latitudes 40° S. and 45° S. winds are likely to reach Beaufort force 7 or above on 5–10 days per month, and south of the 45th parallel the frequency rises to over 10 days per month. West of the above meridian, the area of highest gale frequency dips somewhat towards the south, but in few parts of the zone of the westerlies (*i.e.* south of the 40th parallel at this season) in the frequency less than 3–5 days per month.

The buff-tinted areas on Climatic Charts 5301 and 5302 give an indication of the distribution of gales in summer and winter respectively.

As in the westerlies of other oceans, weather is very variable, periods of overcast skies and rain (or snow) associated with the fronts of eastward-moving depressions alternating with fairer conditions. Fine weather is, however, seldom prolonged, and cloud amounts are generally large in all seasons.

Visibility also varies greatly; with winds from a southerly point it is generally good, while northerly winds are often associated with moderate or poor visibility. Fog is rather common in the summer months, and may be expected on 3–5 days per month over much of the area.

Tropical storms (Hurricanes)

A general description of tropical storms, together with warning signs of their proximity, and the action recommended to ships menaced by them is given in Section A.

In the South Pacific (where they are known as Hurricanes) the area mainly affected is west of about longitude 155° W. and south of latitude 8° –10° S. The very great majority of storms occur from December to April, with January to March as the months of greatest frequency; they are not, however, unknown in other months, and as with the tropical storms of other oceans, the actual number experienced varies greatly from year to year.

More detailed information regarding storm frequencies in specific localities and in different months will be found in the Admiralty Sailing Directions, and in the atlas of Monthly Meteorological Charts of the Western Pacific ocean (M.O.M. 422) referrred to at the head of this section.

The tropical storms which affect northern and western Australian waters, the Arafura and Timor seas are considered in Part III., Chapter I.

CURRENTS

NORTH PACIFIC OCEAN

The Main Circulation

In essentials, the main circulation of the North Pacific ocean resembles that of the North Atlantic ocean, though there are some differences. Owing to the extent of the ocean, and the limitations of shipping tracks, the observations of current so far available are inadequate to give accurate detailed information of the flow of current over large parts of the ocean. This especially applies to the middle longitudes, both in the equatorial region and in the region of variable current lying further northward.

The southern part of the main circulation is formed by the west-going North Equatorial current. Immediately south of this current, the Equatorial Counter-current flows eastward across the ocean, so that the northern boundary of this forms the southern limit of the North Equatorial current. The limits of the Counter-current are not exactly known. The southern limit appears to be nearer the Equator in the western part of the ocean than in the central or eastern longitudes. Furthermore there is some seasonal shift of the current in latitude, probably most marked in western longitudes. Over the greater part of the extent of the ocean the Counter-current is usually found between lats. 4° N. or 5° N. and about 8° N. The South Equatorial current, the northern limit of which reaches to about lat. 4° N., is described under South Pacific ocean.

The North Equatorial current has no defined northern limit. The predominance of the Trade winds decreases with increasing latitude and the westerly currents accordingly decrease. The predominance of westerly current thus gradually lessens until it is lost in the region of variable current which occupies the central region of the ocean. The latitude to which some predominance of westerly current extends appears to vary with the season. In the middle longitudes of the ocean it is between lats. 20° N., and 24° N. in winter, and about lat. 30° N. in the late summer or autumn.

The Equatorial Counter-current flows continuously throughout the year across the whole extent of the ocean, differing in this respect from the corresponding current of the Atlantic. It also differs in the fact of its more direct origin from one of the Equatorial currents, on the western side of the ocean. During March to November the counter-current is formed jointly by the recurvature of the North Equatorial current southward and that of the South Equatorial current northward. In December to February, part of the water of the North Equatorial current is diverted southward down the east coasts of the islands of the Philippine group south of Luzon. This water turns directly eastward and forms the beginning of the counter-current in about long. 128° E. During these months the South Equatorial current, north of the Equator, begins to turn southward in about long. 140° E. to 150° E. and finally south-eastward, so that it plays no part in the formation of the counter-current.

In all seasons part of the North Equatorial current water enters the Celebes sea, emerging therefrom in a north-easterly direction to contribute to the counter-current. The counter-current is strongest in the most westerly part of its course, from northward of Halmahera to about long. 145° E.

To complete the main circulation, a large part of the water of the North Equatorial current turns north-eastward to the eastward of Luzon and passes up the east coast of Formosa to form the Kuro shio, a warm current which corresponds to the Gulf stream of the North Atlantic. Southward of the Japanese islands the Kuro shio flows in a north-easterly direction. This current subsequently fans out to form the North Pacific current, which sets eastward across the ocean to the American coast. It is joined by cold water from the Bering sea, which flows down the east coast of Kamchatka and subsequently turns south-eastward and then eastward. The whole forms a broad belt of variable current with a predominance of easterly sets, filling the greater part of the region between lats. 35° N. and 50° N., across the ocean. The colder part of the east-going water is found north of about lat. 42° N. and is known as the Aleutian (or Sub-arctic) current

Eastward of about long. 160° E., water fans out south-eastward and southward from the southern part of the North Pacific current. Westward of about long. 180°, this water passes into the region of variable current; between longs. 175° W. and 140° W. the south-going water, comprising the whole of the remainder of the North Pacific current, turns south-westward and passes into the North Equatorial current. Between about longs. 140° W. and the American coast, the bulk of the Aleutian current turns southward and south-westward and finally passes into the North Equatorial current. The part of this south-going current near the coast is called the California current.

The California current does not meet the coast. From November to February a counter-current, known as the Davidson current, sets northward, between the California current and the coast to about lat. 48° N. During the rest of the year, the space between the California current and the coast is filled by a number of irregular current eddies.

In the region of the extreme eastern part of the Equatorial Counter-current great seasonal variations occur off the Central American coast, and numerous eddies are formed, which appear to vary from one year to another. In most months the counter-current will be met between lats. 5° and 6° N., and in the long run its water turns northward and then northwestward along the Central American coast, finally passing into the North Equatorial current. In the early months of the year a part of the Counter-current branches to southward and enters the South Pacific ocean (*see* below). There is an inflow into both sides of the Gulf of Panama. Some water from the Counter-current enters its western side, and some water from the Peru current enters its eastern side, during the greater part of the year. There is a resultant outflow in the middle of the Gulf, crossing the meridian of 80° W. and turning south-westward to pass into the South Equatorial current.

The Northern part of the ocean

The currents of the Bering sea are not well-known, but there is a general counter-clockwise circulation round the coasts, northward on the east side and southward on the west side. This cold southward current continues along the coast Kamchatka and passes Chishima rettō, where it becomes known as the Oya shio. The Oya shio continues along the east coast of the main Japanese island of Honshu, until it meets the northern edge of the Kuro shio in about lat. 36° N. The Oya shio thus corresponds to the Labrador current of the North Atlantic ocean. Between lats. 34° N. and 36° N. the Oya shio turns eastward. Water also fans out south-eastward and eastward all along the course of the current, from Kamchatka southward. The resulting easterly current flows parallel and adjacent to the North Pacific current, being known as the Aleutian current, as already stated. It has also been stated that the bulk of the Aleutian current sets southward, on the eastern side of the ocean, to form the California current. The remainder inclines north-eastward, and then sets north-westward past Queen Charlotte islands and along the coast of South-east Alaska. This current is known as the Alaska current. It is reinforced, during November to January, by water from the Davidson current, which then sets up the American coast to as far north as the region of Vancouver island. The Alaska current follows the coastline of the Gulf of Alaska, setting in a westerly direction across its head and subsequently flowing westward along the southern coasts of the Aleutian islands. Westward of the meridians of 155° W. to 160° W., water recurves from the Alaska current in southerly and south-easterly directions to rejoin the east-going Aleutian current. The general circulation of the Gulf of Alaska thus forms a large counter-clockwise eddy. The remainder of the west-going current southward of the Aleutian islands recurves northward, perhaps mainly between Tanaga and Amchitka islands, and so enters the Bering sea. Thence turning north-eastward and eastward it forms the eastern side of the Bering sea circulation, above referred to.

The China seas and other regions westward of the Main Circulation

In the China seas and in Java sea the currents are monsoonal. During the South-West Monsoon period, the general direction of current is west in the Java sea, northeast in the China and Eastern seas and north in the Yellow sea. During the North-East Monsoon period, these directions are reversed to south in the Yellow sea, south-west in the Eastern and China seas and east in the Java sea. In the southern part of the China sea there is an area of variable current westward of Borneo and Palawan in both monsoons, but a weak monsoonal current runs along the west coasts of these islands, alternating between north-east and south-west during the year. The eastern part of the Eastern sea is occupied by the Kuro shio.

In the China seas, the north-east current is found from May to August inclusive. September is the transition month, but the north-east current still persists in the southern part of the China sea. In October the south-west current becomes established everywhere, and this continues till the middle or end of March. April is the transition month.

In the Java sea, the westerly current runs from June to September and the easterly current from November to March. April, May and October are transition months.

In the Japan sea, the general circulation is counter-clockwise throughout the year, the north-going current on the eastern side of the sea being a branch of the Kuro shio which has passed through Korea strait. Part of the north-going current branches off through Tsugaru kaikyō and flows into the Oya shio, and another part branches off through Sōya kaikyō.

There is little or no current in the central part of the Okhotsk sea. A counter-clockwise current flows round the coastal regions.

SOUTH PACIFIC OCEAN

The Main Circulation

The main surface current circulation of this ocean is counter-clockwise. Less is known about the currents of the South Pacific ocean than those of the other oceans south of the Equator, on account of its great extent and the large areas, particularly on the eastern side of the ocean, which are not traversed by the normal steamship tracks.

The South Equatorial current of the Pacific ocean extends from 1° to 4° or 5° north of the Equator in different longitudes and seasons. Its northern limit is defined by the east-going Equatorial Counter-current of the North Pacific ocean, which flows immediately northward of it. The South Equatorial current lies furthest north of the Equator in the southern summer (January) and only just north of the Equator in the southern winter (July).

South of about lat. 6° S., there is, generally speaking, a considerable reduction in the average strength of the South Equatorial current, though the general westerly direction remains. In the region between about lats. 6° S. and 20° S., this weaker and less constant westerly current is known as the South Sub-Tropical current.

On the western side of the ocean the course of the South Equatorial current varies seasonally. In June to August the whole current follows the north coast of New Guinea in a north-westerly direction and then recurves northward and north-eastward, passing into the east-going Equatorial Counter-current of the North Pacific ocean, to which the North Equatorial current of that ocean also contributes. In September to November and in March to May some water also recurves from the northern part of the South Equatorial current into the Counter-current. In December to February the South Equatorial current does not pass into the Counter-current. It recurves south-westward and southward and flows past the north coast of New Guinea in a south-easterly direction. There is thus a complete reversal of current along this coast during the year.

The western side of the main circulation is not well-marked, except along the Australian coast from Great Sandy island to Cape Howe, where the East Australian Coast current sets southward. This is, however, not a very constant current, and northerly sets may be experienced off this coast at any time of the year.

Water flows south-westward, in the long run, from the South Sub-Tropical current to enter the East Australian Coast current, past Ellice islands, the New Hebrides and New Caledonia, but the currents experienced in this region, so far as they are known, show considerable variation. Part of the South Sub-Tropical current flows towards and through Torres strait, into the Indian ocean and this is joined in December to February, by the water of the South Equatorial current that has passed south-eastwards along the north coast of New Guinea, as previously stated. Little is known of the currents of the Coral sea except that in the northern part the resultant set is towards Torres strait and in the southern part it is south-westerly or southerly, towards the East Australian Coast current.

The southern side of the Main Circulation is formed by the Southern ocean current, setting in easterly or north-easterly directions. Observations of this current are scanty over the great extent of the ocean. They appear to show that the current is in general weaker and more variable than it is in the longitudes of the South Atlantic and Indian oceans, and that northerly sets are not infrequent.

Between Australia and New Zealand the current is variable with some predominance of easterly sets. The bulk of the East Australia Coast current mixes with the water of the Southern Ocean current that flows eastward south of Tasmania and also through Bass strait. Some of this combined water sets as a north-easterly current along both the west and east coasts of South island, New Zealand.

The bulk of the Southern Ocean current passes directly into the South Atlantic ocean, south of Cabo de Hornos (Cape Horn). The northern part of this current, however, meets the coast of Chile between Isla Chiloe and the Golfo de Penas. There it divides, part going northward to form the beginning of the Peru current and part following the coast south-eastward to rejoin the main body of the Southern Ocean current south of Cabo de Hornos.

The eastern side of the Main Circulation is formed by the relatively cool Peru current, sometimes known by its older name of Humboldt current. It follows the coastline northward to the equator. Between the Gulf of Guayaquil and the Equator, the bulk of the Peru current trends seaward and passes into the South Equatorial current. The Peru current is of considerable width, perhaps 300 miles or more. The part near the coast is sometimes called the Peru Coastal current, while the part at some distance from the coast, which does not follow the minor irregularities of the coastline, is called the Peru Oceanic current.

A branch of the Peru current continues northward up the coast during the greater part of the year and enters the Gulf of Panama.

The Holy Child (El Nino) current

During the northern winter, in the eastern longitudes of the North Pacific ocean, the east-going Equatorial Counter-current extends further south than at other seasons. At this time, a branch of this current turns southward along the coast of Ecuador into the South Pacific ocean, but in most years its southern limit is only a few degrees south of the Equator. This warm south-going current is called "El Nino," or the Holy Child current. While sometimes it begins to flow about the time of Christmas, it is more regularly observed in February and March. In exceptional years, such as in 1891 and 1925, it extends further south along the coast of Peru, occasionally to beyond Callao. In such years the intrusion of the warm water into the region normally occupied by the cool waters of the Peru current kills the living organisms of the sea, from fish to the minute animals and plants of the plankton, on a wholesale scale. Dead fish later cover the beaches, and so much hydrogen sulphide may be released that ship's paint is blackened, a phenomenon known as the "Callao painter."

The Central Oceanic region

On account of the great width of the South Pacific ocean there is a vast central area, between about the 20th and 45th parallels, which forms the largest area of variable current in the world. Over the greater part of this area current observations are scanty, particularly on its eastern side. Certain regions show a slight predominance of current in various directions; in other regions the number of currents in all directions are almost equal. No general trend of current over any extensive area is shown during any part of the year. Between New Zealand, Norfolk island, Fiji and Tonga, while currents in all directions may be experienced, there is some predominance of currents between north and east, particularly in the half-year May to October.

ICE

GENERAL REMARKS

The following brief account of ice in the Pacific ocean should not be taken as in any way complete or all-embracing. More detailed information than can be given here will be found in the following publications, and the appropriate ones should be consulted before undertaking passages through areas in which ice is likely to be encountered:—

Atlas of monthly Ice charts of the North Pacific Ocean (H.D. 416).

Chart 1241—Ice Chart of the southern hemisphere

Admiralty Sailing Directions covering the appropriate areas.

A general statement regarding ice, including warning signs of its presence is given in Section A of this book.

A factor always to be borne in mind where ice conditions are concerned is their great variability from year to year. For this reason, and also on account of the sparsity of observations in many areas, the charted positions of ice limits should only be regarded as approximate.

Ice that affects the mariner can be broadly divided into two types, though there are numerous sub-types, details of which will be found in the Admiralty Sailing Directions. These two main types of ice are:—

(a) Pack Ice—or frozen sea.

(b) Icebergs—or portions of ice which have broken off the seaward end of glaciers, or from the ice barrier, and been carried away by wind and current.

NORTH PACIFIC OCEAN

Pack Ice

The approximate mean limits of pack ice in March-April and August-September, in which months it attains its greatest and least extent respectively, is indicated on Climatic Charts 5301 and 5302. An examination of these limits indicates the marked influence of the prevailing winds and currents; on the western sides of the ocean the prevalence of northerly winds in the winter months, and the cold water of the Oya shio or Kamchatka current causes ice to be prevalent in relatively low latitudes, while the warm North Pacific current maintains ice-free conditions throughout the year in the open waters of the eastern North Pacific (excluding the northern part of the Bering Sea).

Along the eastern coasts of the Asiatic continent in the average winter, navigation is impeded as far south as latitude 45° N., and also in sheltered areas in the south-western part of the sea of Okhotsk in October. By mid-November coastal navigation is interrupted as far south as latitude 60° N., and is closed north of 62° N.; ice is also present in all coastal waters of the northern and western parts of the sea of Okhotsk, in the northern part of the Gulf of Tartary, and east of Sakhalin north of the 50th parallel. In December, navigation is closed to all ports north of latitude 60° N., and ice is likely to be encountered anywhere in the Gulf of Tartary north of the 47th parallel as well as along the east coast of Sakhalin and along the coasts of the Russian Maritime Province as far south as latitude 43° N.

From January to March the whole of the coastal waters of the Russian Maritime Province, the greater part of the Gulf of Tartary, Northern Hokkaidō and the south-west Kuril islands are encumbered with ice in varying degrees, as also is the whole of the Sakhalin area and the greater part of the Sea of Okhotsk except the deep central portion. Ice is also present in the vicinity of the north-eastern Kurils, and along much of the east coast of Kamchatka and northward thereof.

In April the ice edge begins to retreat northward and by mid-May in an average winter, there is little or no ice south of about latitude 52° N. By mid-June ice is confined to the south-west part of the Sea of Okhotsk, the northern part of Penjinski bay, the Litke strait, Olyntorski gulf, and from Anydyr bay northward. By late July, vessels can generally pass through the Bering strait.

The months during which ports are closed to navigation varies not only with the severity of the season and the prevailing winds, but also with the availability of ice breakers; detailed information should be sought on the Admiralty Sailing Directions.

Ice may also be encountered in the shallow waters of the Gulfs of Pohai and Liaotung between the middle of November and the end of March; the port of Newchwang at the head of the latter gulf is closed to navigation from December to March.

Along the Alaskan coast in the average winter, ice extends as far south as about latitude 56° N. from December to April; in very severe winters the extreme north-eastern Aleutian islands may be affected. The ice edge advances southward during October and November and retreats northward during May and June, and ice is not normally encountered from, July to September except in the vicinity of the Bering strait.

During the ice season, the northern half of the Bering sea is filled with pack ice, though it is not solidly frozen.

Icebergs

Icebergs are not a feature of the North Pacific, because there are no breeding grounds such as are found in the North Atlantic off the coasts of Greenland. Occasional floebergs (massive pieces of sea ice resembling a small berg in appearance) must, however, be expected among the pack ice, especially in the western part of the Bering sea.

SOUTH PACIFIC OCEAN

Pack Ice

The approximate mean limits of pack ice in March-April and August-September, in which months it reaches its least and greatest extent respectively is indicated on Climatic Charts 5301 and 5302. None of the normally inhabited parts of the area are affected, but its presence prevents the sailing of a Great Circle track between Australian or New Zealand ports and the southern ports of South America.

Icebergs

The icebergs that occur in the southern ocean are not, in the great majority of cases, carved from glaciers, but consist of portions which have broken away from the great ice barrier; they are flat topped and may be of immense size.

The mean northern limit of icebergs in November and December, in which months it reaches its furthest north, runs from about 100 miles south of Cabo de Hornos along about the 57th parallel to longitude 90° W. whence it curves northward to latitude 52° S. in longitude 120° W.; between 120° W. and the 180th meridian it is situated between latitudes 50° S. and 52° S., west of which it bends to the southward to about latitude 55° S. in the longitude of Tasmania.

In May and June the mean limit of bergs is everywhere south of the 55th parallel; west of longitude 150° W. it is within a degree or two of latitude 60° S.

In many parts information is too scanty to enable the extreme limits of bergs to be given with confidence, but over much of the period from about August to January it is probably situated between 45° S. and 50° S. between longitude 100° W. and 170° E.; outside of this sector it is south of the 50th parallel. In May and June, bergs are unlikely anywhere north of latitude 50° S.

SECTION B. PART IV.

Chapter II

NAVIGATION IN THE PACIFIC—ROUTES FROM PORTS IN AUSTRALIA, NEW ZEALAND AND THE PACIFIC ISLANDS

NAVIGATION IN THE PACIFIC OCEAN

General remarks

There are very large areas of the Pacific ocean which are still unsurveyed, or very imperfectly surveyed. In many areas no sounding at all has been recorded.

The presence of a single sounding on the chart can only prove the non-existence of a shoal or reef within a very limited area, an approximation of which is as follows:—

No shoal is likely to exist within a radius of 7 miles of a sounding of 2,000 fathoms (3,657^{m}6); within 3½ miles of a sounding of 1,500 fathoms (2,743^{m}2); or within 2 miles of a sounding of 1,000 fathoms (1,828^{m}8). In 500 fathoms (914^{m}4) a danger may exist within a half or a quarter of a mile or less, such is the precipitous rise of a coral reef or a vigia *(see below)* from the ocean bed.

Many reefs, shoals, or discoloured water were reported in the years 1943 to 1945 when many more vessels were navigating in the Pacific ocean, often off the usual routes.

CAUTION. The routes laid down in this and subsequent chapters are those considered most likely to lead clear of dangers, but owing to the imperfect surveys *(see above)*, the only safeguard is a good look out. In the interests of all vessels it cannot be stressed too strongly that a sounding should be obtained (from a boat if possible) over any suspected danger.

Coral islands and reefs

Definitions.—Most of the islands and reefs described in this volume are coral structures of the following well-defined types:—

Atoll.—An atoll comprises one or more coral islands, of little elevation, situated on a strip or ring of coral surrounding a central lagoon. The islands of Archipel des Tuamotu are nearly all of this character.

Many of these atolls have passages through the ring of coral reef of sufficient depth to admit the passage of ships to secure and sheltered anchorage in the enclosed lagoon; but in some, the passages admit only boats, while in others the ring is without an opening.

Atollon.—An atollon is a small atoll on the margin of a large one.

Barrier reef.—A barrier reef may front a coastline, or encircle an island or group of islands, leaving a deep channel between it and the shore. The Great Barrier reef of Australia, which extends for about 1,000 miles in a north-westerly direction, at a distance of from 12 to 140 miles from the Queensland coast, is an example of the former, and the Barrier reef surrounding Tahiti, the principal island of Îles de la Société, is an example of the latter. These barrier reefs form natural breakwaters, with passages through them which lead into good harbours; these passages are generally opposite a valley in the land sheltered by the reef. Tidal streams and currents are generally strong and uncertain in these barrier openings.

Fringing reef.—A fringing reef is a coral reef extending from the shore, seldom for a long distance, having little depths of water over it, and no ship passage between it and the land. As the seaward edge of these reefs is generally the highest part, the tide is more or less impounded on some of them, and forms a narrow passage between the edge of the reef and the shore which can usually be navigated by canoes or boats. A coastline with a fringing reef is also frequently fronted by a barrier reef, with a deep passage between them.

Navigation among coral reefs

As successful navigation through or among coral reefs is often dependent upon the eye, the conditions under which these can be most easily seen are important. Reefs are always more plainly visible from the masthead than from the deck or bridge, and when the sun is high rather than when it is low, also with the sun behind the observer rather than facing him. If the sea is glassy calm, it is extremely difficult to distinguish a reef.

The best conditions, therefore, are with the sun high and behind the observer, and the sea ruffled by a light breeze. Reefs with a depth of about 3 feet (0^{m}9) over them then appear to be light-brownish in colour, and those with one fathom (1^{m}8) or more, appear to be clear green, deepening to a darker green as the depth increases, and finally to a deep blue when out of soundings.

Under favourable conditions, a shoal with a depth of 3 or 4 fathoms (5^{m}5 or 7^{m}3) over it can be seen from aloft at a considerable distance, but where, and in proportion as, the depths increase beyond this, the bottom will only be seen when nearly over it.

The use of polarised or polaroid glass spectacles is strongly recommended, as they make reefs and shoals stand out much more clearly; with them, such dangers can be seen under conditions when they are invisible to the naked eye.

Vigias

A vigia is a reported shoal, the existence or exact locality of which is doubtful.

In no part of the world are there so many dangerous coral reefs and low islets, rising abruptly from great depths, as in the Pacific ocean. In addition, a vast number of vigias have from time to time been reported, and though many have been disproved of late years by laborious research, many others are still indicated on the charts, and until their existence has been disproved, they must remain a source of anxiety and perplexity to the navigator.

Numerous reports of vigias are from the captains of whaling ships, among whom it is a common saying " that they do not care where their ship is so long as there are plenty of whales in sight." Such doubtful navigation, and strong currents, account for a large proportion of vigias that encumber or have encumbered the charts of the Pacific ocean, and those who may observe the appearance of a danger are most earnestly urged to obtain soundings, from a boat if possible.

The semblance of submerged dangers is sometimes caused by reflection from the clouds, by volcanic disturbance, by shoals of fish, and by marine animalculae, all of which often resemble reefs and breakers so closely as to deceive the most experienced. A few examples of such cases here follow:—

Captain Maclear, in H.M. surveying vessel *Alert*, remarked that " whenever the sea becomes smooth, *confervoid algæ* appear on the surface and form masses of discoloration, very like the colour of a coral reef some 3 fathoms (5^{m}5) below water; the officers of the *Alert* were occasionally deceived by these. Also, when there is any meeting of currents of different temperatures, shoals of fish often appear, and large fish splash and spout water so as to resemble breakers, I have little doubt that these are the principal sources of vigia."

Navigating-Lieutenant W. H. Petley, H.M. surveying vessel *Alert*, stated that on December 26th, 1880, when searching for Le Rhin breakers, " he saw what he felt confident were breakers, but upon examination it was merely large fish jumping and throwing the water high in the air; no bottom at 300 fathoms (548^{m}6) could be obtained at the spot." Also, " during the run on the parallel of 24° 14′ S., from long. 176° 02′ W. to 179° 18′ W., we passed through dense fields of sea sawdust or *confervæ*. Twice the ship was suddenly ' hove-to ' in broad daylight in consequence of the appearance presented resembling a reef awash, but no bottom could be obtained at 300 fathoms (548^{m}6)."

Commander Oldham, of H.M. surveying vessel *Egeria*, in 1889, reports that much green water, having the appearance of shoals, was met with between Tongatapu and Fonua Fo'ou or Falcon island, but on sounding deep water was found, and the sea contained minute particles of volcanic matter. Doubtless many of the shoals formerly reported in the Tonga group, and upon which no soundings were taken, were similar in appearance to the above.

In July, 1888, when H.M.S. *Egeria* was searching for Pelorus reef, and was about to slip a beacon on a bank which had been found, discoloured water was reported from the masthead which was almost immediately seen from the deck; by 0900 the beacon was dropped in a depth of 24 fathoms (43^{m}9) with a stretch of light greenish water extending in a northerly and southerly direction for about half a mile. Boats were lowered and remained all day in this green water searching for shoaler depths.

Meantime more discoloured water was reported from aloft, and this being verified by an officer, Captain Aldrich left the boats near the beacon and took the ship towards it, and after going 2 miles a small streak was seen from the poop of the vessel. As it had remained stationary and had every appearance of being a very small shoal, the ship was taken to within half a cable of it, and a boat lowered to sound on it; no bottom, however, could be found from the boat, so the ship was put in the middle of the patch and a sounding of 150 fathoms (274^{m}3), no bottom, obtained. A bucket of the water was obtained and a bottle of it preserved, but Captain Aldrich did not detect anything in it to account for the light greenish colour; it may be that the colouring matter was not actually on the surface. The fact remains that this small patch was sighted from aloft at very nearly 3 miles distant, and that even when within half a cable of it, it was believed to be a shoal, and that a sounding of 150 fathoms (274^{m}3), no bottom, was actually taken in the middle of the patch.

In this case it would appear probable that the discoloration was caused by organisms hatched on the bank, the matter floating away.

Commander Nicolls of H.M.S. *Cormorant*, on a passage from Malden island to Penrhyn island, observed what was thought to be a shoal about 4 miles distant. " It presented the appearance of waves breaking over rocks just under water. Lowered a boat to examine it. Shoal disappeared. I take it to be a shoal of bonitas, as since then we have had the same thing close alongside caused by fish."

In 1894, H.M. surveying vessel *Penguin* searching for the *Ocean Ranger* reef, reported to exist in lat. 18° 44′ S., long. 157° 02′ E., discovered a bank with depths of from 800 to 1,000 fathoms (1463^{m}0 to 1828^{m}8), situated between the parallels of 18° 48′ S. and 19° 05′ S. and the meridians of 156° 40′ E. and 157° 03′ E., having depths of from 1,500 to 1,800 fathoms (2743^{m}2 to 3291^{m}8) around. During the search, and whilst obtaining a sounding of 1,713 fathoms (3132^{m}7), a considerable tide-rip was observed extending about 3 miles in a northerly and southerly direction from the ship, the ship herself being in the centre of the tide-rip, which might have been mistaken for breakers; and some such phenomenon probably was the origin of the report made by the master of the *Ocean Ranger*.

Doubtless many tide-rips and shoals of fish are reported as " breaking reefs." On every occasion of such things being observed, a sounding should be obtained so as to avoid the necessity of a subsequent search for a danger which may have no existence.

Currents among the islands

See the remarks at the beginning of sub-section (iv) of Section C., Part III., Chapter I., on page 295

ROUTES FROM PORTS IN AUSTRALIA, NEW ZEALAND AND THE PACIFIC ISLANDS

Route 485. Southern route across the South Pacific ocean

The most southerly route usually adopted by the principal steamship companies crossing the South Pacific ocean *from west to east* is a line joining the following points:—

lat. 48° 30′ S.	long. 165° 00′ W.
lat. 49° 00′ S.	long. 160° 00′ W.
lat. 49° 30′ S.	long. 150° 00′ W.
lat. 50° 00′ S.	long. 140° 00′ W.
lat. 50° 45′ S.	long. 130° 00′ W.
lat. 51° 30′ S.	long. 120° 00′ W.
lat. 52° 15′ S.	long. 110° 00′ W.
lat. 52° 45′ S.	long. 100° 00′ W.
lat. 54° 00′ S.	long. 90° 00′ W.
lat. 55° 00′ S.	long. 80° 00′ W.

When the Great Circle track between the ports of departure and destination passes to the southward of the above line, vessels *proceeding eastward* are advised to steer, by Great Circle if possible, to join this route at a convenient point. Similarly, vessels should leave the Southern route at a suitable point which will enable them to make their destination by Great Circle, if possible, or by Rhumb line (or lines), without passing southward of the trans-ocean track.

Examples of the use of the Southern route will be found in the routes that follow.

CAUTION. The route across the South Pacific ocean *from east to west* lies far to the northward of the west to east route, following, as it does, the parallel of 30° S. between the meridians to 120° W. and 140° W. or 150° W.

(i) ROUTES FROM HOBART

See Routes 477 to 482 for passages from Hobart to ports in the Indian ocean.

See Route 483 for Hobart to Sydney.

Route 486. Hobart to Bluff harbour and Foveaux strait

After clearing Cape Raoul, at eastern entrance of Storm bay, take the Great Circle track to Solander island, off the entrance to west of Foveaux strait, which is visible 40 miles and is an excellent landmark. From this point proceed as directly as navigation permits to destination. *(See* New Zealand Pilot).

Distance from Hobart to Bluff harbour, 930 miles.

Route 487. Hobart to Wellington

Round Cape Pillar and Tasman island, at a distance of one mile (if weather is clear), and thence steer on a Great Circle for a position lat. 40° 30′ S., long. 173° 55′ E. off the western entrance to Cook strait. Thence proceed as directly as navigation permits to destination. *(See* New Zealand Pilot).

Distance from Hobart to Wellington, 1,290 miles.

Note.—If proceeding to Wellington around the South Cape of New Zealand, the distance from Hobart is 1,396 miles. If passing through Foveaux strait, this distance is lessened by 11 miles.

Route 488. Hobart to Auckland

After rounding Cape Pillar, take the Great Circle track so as to pass midway between the Three Kings islands and Cape Maria van Diemen. *(See* New Zealand Pilot.) From this point, steer as directly as navigation permits to destination.

Distance from Hobart to Auckland, 1,517 miles.

Note.—If proceeding via Cook strait to Auckland, the distance is 1,849 miles. If around the South Cape of New Zealand, the distance is 1,899 miles.

Route 489. Hobart to Pacific ocean islands or to ports on American coast

A Great Circle track should be taken from Cape Pillar, Tasman island, to Nouméa (New Caledonia), Suva (Fiji islands), Tongatapu (Tonga or Friendly islands), or the Samoan group, so far as direct navigation permits.

Distance from Hobart to Apia (Samoa), 2,775 miles; to Nouméa, 1,604 miles; to Suva, 2,195 miles; to Tongatapu, 2,326 miles.

For other Pacific islands, or for the American coast, departure should be made from Sydney, Brisbane, or some port in New Zealand.

Route 490. Hobart to Estrecho de Magallanes (Magellan Strait), or Cabo de Hornos (Cape Horn)

After clearing the entrance of Storm bay, take the Great Circle track to a position lat. 47° 50′ S., long. 167° 50′ E., midway between The Traps, off the South Cape of New Zealand, and The Snares. *(See* New Zealand Pilot.)

From this point follow Route 496, Melbourne to Estrecho de Magallanes or Cabo de Hornos.

Distance from Hobart to Cabo de Hornos, 5,552 miles; to Cabo Pilar (Cape Pillar), 5,265 miles; to The Snares, 900 miles.

Route 491. Hobart to Brisbane

After rounding Cape Pillar, steer a direct course towards Sugarloaf point on the Australian coast, northward of Port Stephens, and thence follow the coast onwards to destination; or, if desirous of avoiding the southerly set of current, follow the directions of Route 483, and keep close to the Australian coast. After passing Port Jackson, continue the coastal route to the northward. This increases the whole distance by about 20 miles. *See* Australia Pilot, Vol. III.

Distance from Hobart to Brisbane, 1,132 miles.

(ii) ROUTES FROM MELBOURNE

Distances are calculated from Port Melbourne.

See Routes 470 to 474 for passages from Melbourne to ports in the Indian ocean.

See Route 475 for Melbourne to Sydney.

Route 492. Melbourne to Auckland

Steer through Bass strait, so as to pass Wilson promontory at a distance of 2 miles *(see* Route 475) and from thence take the Great Circle track so as to pass midway between the Three Kings islands and Cape Maria van Diemen. *(See* New Zealand Pilot.) From this point steer as directly as possible to destination.

Distance from Melbourne to Auckland, 1,644 miles.

Route 493. Melbourne to Wellington

After clearing Bass strait (*see* Routes 475 and 492) take the Great Circle track to a position lat. 40° 30′ S., long. 173° 55′ E., off the entrance of Cook strait. From this point proceed as directly as navigation permits to Wellington. *(See* New Zealand Pilot.)

Distance from Melbourne to Wellington, 1,489 miles.

Route 494. Melbourne to Bluff harbour or Foveaux strait

After leaving Port Philip, steer to pass through Banks strait (Australia Pilot, Vol. II), and after passing Swan island light take the Great Circle track for Solander island, off the entrance to Foveaux strait, which is visible 40 miles, and is an excellent landmark. *(See* New Zealand Pilot.) From this point proceed as directly as navigation permits to destination.

Distance from Melbourne to Bluff harbour, 1,208 miles.

Note.—The distance is increased by about 50 miles if Bass strait is taken instead of Banks strait.

Route 495. Melbourne to Pacific islands or to ports on American coast

After clearing Bass strait, take a Great Circle track so far as direct navigation permits, to Nouméa (New Caledonia), Suva (Fiji islands), Tongatapu (Tonga or Friendly islands), the Samoan group, or Tahiti (Îles de la Société).

Distance from Melbourne to Apia, 2,837 miles; to Nouméa, 1,597 miles; to Suva, 2,233 miles; to Tahiti, 3,691 miles; to Tongatapu, 2,412 miles.

If proceeding to other Pacific islands or to American ports, departure should be taken either from Sydney, Brisbane, or from one of the eastern ports of New Zealand.

Route 496. Melbourne to Estrecho de Magallanes (Magellan strait) or Cabo de Hornos (Cape Horn)

See remarks on Ice on pages 40 and 126.

After clearing Port Phillip, pass through Bass or Banks strait *(see* Route 494) and take the Great Circle track thence to a position lat. 47° 50′ S., long. 167° 50′ E., passing midway between The Traps, off the South Cape of New Zealand (Stewart island), and

The Snares. *(See* New Zealand Pilot.) From this point, take a second Great Circle track to a position lat. 48° 30′ S., long. 165° 00′ W.; thence steer on Rhumb line tracks to lat. 50° 00′ S., long. 140° 00′ W.; and thence again on Rhumb lines to a position lat. 52° 40′ S., long. 100° 00′ W. *See* Route 485.

From this point, *if bound to Estrecho de Magallanes,* steer on Rhumb lines to Cabo Pilar, or, *if rounding Cabo de Hornos,* also on Rhumb lines so as to pass about 20 miles southward of Islas Diego Ramirez, and turn northward on reaching lat. 56° 50′ S., long. 72° 40′ W. (*See* South America Pilot, Part II. and Route 485).

Distance from Melbourne to Cabo de Hornos, 5,827 miles; to Cabo Pilar, 5,540 miles; to The Snares, 1,175 miles.

(iii) ROUTES FROM SYDNEY

Route 497. Sydney to Melbourne, Adelaide, Albany and Fremantle

(1) To MELBOURNE.—After clearing Port Jackson, keep at about 15 miles off the coast, along the 100 fathom (182^{m}9) line of soundings, in order to take advantage of the southerly current, closing the land in the vicinity of Cape Howe, or Gabo island. From off Gabo island steer for South East point lighthouse, Wilson promontory, and pass about 2 miles southward of the lighthouse, and the Anser islands. Thence proceed as directly as navigation permits (*see* Australia Pilot, Vol. II) to Melbourne.

(2) To ADELAIDE.—Having rounded Wilson promontory as in (1), shape course for Cape Otway, which should not be approached nearer than 3 miles. From this point, steer to pass about 5 miles southward of Cape Nelson, 10 miles south-westward of Capes Northumberland and Banks, and thence make a direct course to Cape Willoughby; thence proceed as directly as navigation permits, through Backstairs passage, to Adelaide.

Notes.—Care must at all times be taken to guard against a set towards the land; but with southerly and westerly winds, the coast should be given a much greater berth, as a current of one knot sometimes sets towards it between Capes Otway and Willoughby.

From Cape Northumberland to Spencer gulf, give a good berth to the South-west Young rock, which is only 5 feet (1^{m}5) high, and make allowance for the easterly set which usually prevails. However, from December to March, with south-easterly winds, the current runs to the north-west at about one knot.

In the event of threatening weather from the south and west, care must be taken by low-powered steamers to secure a good offing.

(3) To ALBANY, CAPE LEEUWIN and FREMANTLE.—Proceed as in (1) and (2), above, and after passing Cape Otway, take a Great Circle track so as to make the land off St. George's sound, for Albany.

If bound for Fremantle, continue along the coast at from 10 to 15 miles off it, giving a sufficient berth to the White-topped rocks, and round Cape Leeuwin at about the same distance. Thence proceed to Fremantle as directly as navigation permits. *See* General directions for rounding Cape Leeuwin under Route 452, and Caution under Route 462.

Distance from Sydney to Adelaide, 973 miles; to Albany, 1,818 miles; to Cape Leeuwin, 1,960 miles; to Fremantle, 2,140 miles; to Melbourne, 582 miles.

Route 498. Sydney to Hobart

After clearing Port Jackson, keep at a distance of about 15 miles from the coast, so as to get the full benefit of the southerly set of current; and after leaving Cape Howe, steer so as to pass down the east coast of Tasmania at a not less distance than five miles. Cape Pillar may be rounded at one mile, if weather is clear; and the courses up Storm bay, and into Hobart are as direct as navigation permits. *(See* Australia Pilot, Vol. II.)

Distance from Sydney to Hobart, 635 miles.

Route 499. Sydney to Foveaux strait or Bluff harbour

After clearing Port Jackson, take the Great Circle track for Solander island, off the entrance to Foveaux strait, which is visible 40 miles, and an excellent landmark. Thence proceed as directly as possible to destination. *(See* New Zealand Pilot, and Note as to Fog at the beginning of Sub-section (vi) on page 140.

Distance from Sydney to Bluff harbour, 1,105 miles.

Route 500. Sydney to Wellington

After clearing Port Jackson, take the Great Circle track for lat. 40° 30′ S., long. 173° 55′ E., off the entrance of Cook strait. Thence proceed to destination as directly as possible. *(See* New Zealand Pilot and Note as to Fog as in Route 499.)

Distance from Sydney to Wellington, 1,233 miles.

Route 501. Sydney to Auckland

After clearing Port Jackson, make a direct course to sight the Three Kings islands in lat. 34° 08′ S., long. 172° 08′ E., 32 miles north-westward of Cape Maria Van Diemen; pass on either side of them, but at about 5 miles northward of them is preferable. Steer thence as directly as navigation permits. *(See* New Zealand Pilot and Note as to Fog as in Route 499.)

Distance from Sydney to Auckland, 1,274 miles.

Route 502. Sydney to Tahiti

After clearing Port Jackson take the Great Circle track direct to destination.

Notes.—The track passes in deep water between Raoul, or Sunday island and Macauley island, in the Kermadec islands, 60 miles apart. The current of this locality is usually to the north-eastward at about one knot. *(See* New Zealand Pilot.)

When within about 400 miles of Tahiti, the route passes between Îles Maria, 66 feet (20^{m}1) high, and Île Rimatara, 315 feet (96^{m}1) high at western end of Archipel Tubuai. The distance between them is 120 miles, and the water is deep. (*See* Pacific Islands Pilot, Vol. III.) The current in the vicinity is westerly (South Equatorial current) at from 12 to 20 miles a day.

Distance from Sydney to Tahiti, 3,304 miles.

Route 503. Sydney to Fiji, Samoa and Tonga islands

(1) To SUVA (FIJI ISLANDS).—After clearing Port Jackson, take the direct Great Circle track to the Kandavu passage, and thence to destination.

Notes.—The track crosses the meridian of 160° E. at lat. 30° 00′ S., and thus passes about 22 miles south-eastward of Elizabeth reef. *(See* Australia Pilot, Vol. III, Caution as to variability of currents in the vicinity.)

The track crosses the meridian of 170° E. at lat. 24° 10′ S., and that of 175° E. at lat. 20° 50′ S., and thus passes about 18 miles south-eastward of Hunter island, 974 feet (296^{m}9) high, and 32 miles north-westward of Conway reef (about 6 feet (1^{m}8) high). (*See* Pacific Islands Pilot, Vol. II.)

See Section D. Part III. Index on pages 357 and 358.

(2) To Apia (Samoa islands).—Take the direct Great Circle track to lat. 20° 00′ S., long. 180° 00′, passing about 30 miles northward of Lord Howe island. From lat. 20° 00′ S., pass midway between Ongea Levu and Vatoa, or Turtle island, at a distance of 20 miles from either. Thence steer to cross long. 175° 00′ W. at lat. 16° 20′ S., thus passing 20 miles north-westward of Curaçao reef, and through Apolima strait, between Savaii and Upolu, to destination.

(3) To Tongatapu (Tonga islands).—After clearing Port Jackson, take the direct Great Circle track to pass between Tongatapu and 'Eua islands, and thence to destination.

Notes.—The track passes 10 miles south of Ball's Pyramid (1,816 feet ($553^{m}5$) high), and close southward of Norfolk island. (*See* Australia Pilot, Vol. III.)

The track crosses the 180th meridian in lat. 23° 45′ S., and thus passes about 20 miles north-westward of the N. Minerva reef (awash), and the same from Pylstaert island (1,165 feet ($355^{m}1$) high) (*See* Pacific Islands Pilot, Vol. II.)

Distance from Sydney to Apia, 2,357 miles; to Suva, 1,735 miles; to Tongatapu, 1,955 miles.

Route 504. Sydney to Hawaiian islands and Fanning island

(1) To Honolulu (Hawaiian islands).

(a) Via Suva.—Take Route 503 (1), to Suva and thence proceed by the Nanuku passage, either on a Great Circle passing through the Phœnix group, or on a Rhumb line to pass clear to the eastward of the group, and on a second Rhumb line thence to destination.

By passing eastward of the Phœnix group, the distance is increased by about 40 miles.

Note.—The passage through the Phœnix group is in deep water (over 1,000 fathoms ($1828^{m}8$)), but owing to the low islets and reefs it is not recommended, especially at night.

(b) Direct (without calling at Suva).—After clearing Port Jackson, steer along the coast to the northward out of the strength of the south-going current, as far as Sugar Loaf point. From this position, lay a course to pass 30 miles eastward of Cato island, and thence to a position in lat. 20° 00′ S., long. 156° 30′ E., passing about 30 miles eastward of the Kenn reef. (*See* Australia Pilot, Vol. III.) From this point steer to cross long. 170° 00′ E., at lat. 10° 00′ S., and thence to cross the Equator at long. 178° 50′ W. From the Equator steer a Rhumb line course to destination.

Notes.—This track leads midway between the Torres islands, northward of the New Hebrides, and Vanikoro island, the southernmost of the Santa Cruz group.

It afterwards passes about midway between Nanumea, the northernmost of the Ellice islands, and Arorae, the southernmost of the Gilbert islands, at about 50 miles from either of these islands.

(2) To Fanning island.

CAUTION. No fuel of any kind is available at Fanning island.

(a) Direct.—Take a Rhumb line course for a position in lat. 22° 10′ S., long. 170° 00′ E., passing 20 miles northward of Middleton reef; thence continue on a second Rhumb line, direct to Fanning island, passing about 30 miles westward of the north-western reefs of the Fiji islands, and the same distance westward of Atafu, the westernmost island of the Tokelau islands.

CAUTION. This track passes close to a shoal of small extent reported in 1944 to lie about 14 miles east-south-eastward of Rotumah shoal. Great care must be exercised as the bottom was reported to be clearly visible.

(b) Via Suva.—Take Route 503 (1) to Suva; and thence proceed by the Lakemba passage or Nanuku passage (*See* Pacific Island Pilot, Vol. II) on a Rhumb line direct to Fanning island, passing at about 20 miles eastward of Fakaofo, the easternmost of the Tokelau islands.

Distance from Sydney to Honolulu by (1) (a), 4,518 miles; by (1) (b), 4,543 miles; to Fanning island by (2) (a), 3,600 miles; by (2) (b), 3,619 miles.

Route 505. Sydney to Nouméa (New Caledonia)

Proceed direct, crossing the meridian of 160° E. at lat. 27° 40′ S., and thus passing about 55 miles north-westward of Middleton reef (awash). (*See* Australia Pilot, Vol. III.) There are no other dangers near the track.

Distance from Sydney to Nouméa, 1,067 miles.

Route 506. Sydney to Brisbane

Proceed as direct as navigation permits, keeping near to the coast, so as to be out of the strength of the Australian current, setting southward nearly throughout the whole year. (*See* Australia Pilot, Vol. III.)

Distance from Sydney to Brisbane, 515 miles.

Route 507. Sydney to Thursday island (Torres strait)

General remarks.—Vessels proceeding from Sydney to Torres strait can take one of two routes, known as the Outer and Inner routes. The Outer route, unless for some special reason, is only used by sailing vessels. It is described generally below and in greater detail in Australia Pilot, Vol. III; it takes a vessel eastward of the Great Barrier reefs, through the Coral sea, and enters Torres strait by Raine Island or the Great North-east channel, or other openings northward of Cape Melville.

(a) Inner route.—The Inner route is the one usually taken by all steam vessels, ensuring, as it does, smooth water for the greater part of the passage; the numerous beacons placed on the reefs, together with the lighthouses at the most dangerous parts of the route, tend to give comparative safety, and the saving of the distance is considerable.

CAUTION. Implicit reliance should not be placed in beacons marking the inner routes, as they are liable to be washed away.

When northward of Barnard islands, vessels should be kept, as far as possible, on the track laid down on the Admiralty charts.

Passages for vessels proceeding northward, via the Inner route, passing through the Curtis or Capricorn channels, are described in Australia Pilot, Vol. IV. The track laid down is the same, reversed, for vessels proceeding southward from Torres strait.

Curtis and Capricorn channels are the only entrances into the Inner route from south-eastward. Between Queensland ports and New Guinea, the route through the various passages is, since the recent surveys of these openings and the accurate determination of the positions and extent of most of the outlying reefs between lat. 13½° S. and 18° S., rendered merely a matter of careful navigation, provided the sun is in a favourable position. (*See* "Navigation among coral reefs" in the general remarks at the beginning of this chapter.)

Most of the openings trend in a north-easterly and south-westerly direction, thus rendering them available for a sailing vessel for either entry or departure with the prevailing South-East Trade wind.

Lark pass (*Lat. 15° 07′ S., Long. 145° 43′ E.*), which is marked by beacons, and is much used when making the passage between Cooktown and New Guinea, is described in Australia Pilot, Volume III.

CAUTION. When navigating the Inner route, if there be any doubt about the position, due to thick weather or darkness, the vessel should be anchored until more favourable conditions prevail. Northward of Cooktown, the South-East Trade wind, which prevails from April to October, causes at times a dense haze, which renders it difficult to pick up islands and landmarks at night.

Any parts of the route not sounded (as shown by absence of soundings on the charts) must be traversed with more than ordinary caution.

Pilots.—Application for a pilot for the Inner route may be made to the Secretary of the Marine board, Brisbane.

Masters of vessels proceeding to Australian East Coast ports, and requiring a Torres straits pilot at Thursday island, are advised to notify the Torres Straits Pilots' Association, Sydney, telegraphic address "Torres—Sydney," from their last port of call, giving the approximate time and date of arrival at Thursday island. This will prevent delay, and enable a pilot to be on the station. Vessels are required to anchor off Tucker buoy for medical inspection.

The pilot cutter displays flag K of the International Code of Signals, and is a motor launch, painted white, with two masts.

Curtis channel.—A full description of this channel and directions for its navigation will be found in Australia Pilot, Vol. IV.

Tidal streams.—When passing through Curtis channel, the flood and ebb tidal streams will be found to run about south-south-westward and north-north-eastward, respectively, while about 10 miles northward of Bustard head, their directions are westward and eastward, respectively.

Capricorn channel.—Capricorn channel is the broadest, shortest and safest entrance into the Inner route from southward. It is entered between the Capricorn group and Swain reefs, about 60 miles north-eastward, and extends about 100 miles in a north-westerly direction, to a position between Cheviot island and Cape Townshend, where it joins Curtis channel.

The channel may be entered anywhere between the parallels of 22° 30′ and 23° 10′ S. and the meridians of 152° and 152° 30′ E. It lies north-eastward of the Curtis channel, between the mainland, and the inner edge of the Great Barrier reefs.

Great caution is necessary if approaching the southern extremity of Swain reefs, as there are depths of from 50 to 60 fathoms (91^{m}4 to 109^{m}7) close to them.

A keen look-out from the masthead, and ready action, is always necessary when navigating amongst reefs or in passing through partially surveyed water; the sun should be in a favourable position for seeing the reefs. (*See* "Navigation among coral reefs," on page 127.)

Tidal streams.—The flood tidal stream sets westward, and the ebb tidal stream eastward, at a rate of from one to 2 knots; but, with south-easterly winds, a greater degree of north-westerly set may be expected.

In the offing, 20 miles eastward of Hixson cay, the ebb tidal stream sets eastward at a rate of three-quarters of a knot, and the flood tidal stream westward at a rate of 1½ knots; the turn of the stream takes place later than low water, and earlier than high water, on the reef.

A strong westerly set is stated to be experienced, frequently, in the vicinity of the Capricorn group; caution is necessary, therefore, when making North Reef light.

Route from Curtis or Capricorn channels northward.—The passage through the Inner route as far as Cape York and Adolphus channel is described fully in Australia Pilot, Vol. IV; thence to Thursday island and the channels in the Torres strait is described in Australia Pilot, Vol. III.

(b) Outer Route.

(i) Via Raine Island entrance.—Steer up the coast from Port Jackson as far as abreast of Cape Byron; and from that point make a direct course so as to pass about 30 miles westward of Wreck reef, and 20 miles eastward of Frederick reef; thence steer to round Lihou reef at about 50 miles distance, and thence to a position in lat. 15° 30′ S., long. 152° 00′ E.

From this point take a direct course for Raine Island entrance (Beacon tower, 64 feet (19^{m}5) high, on Raine island). There is a north-going current in this vicinity which should be allowed for.

The directions from Raine Island entrance, by Blackwood channel, to Inner Route and Thursday island are given in Australia Pilot, Vol. III.

(ii) Via Great North-east channel.—Take the route described in (b) (i) above as far as lat. 15° 30′ S., long. 152° 00′ E., and make a direct track thence to lat. 9° 40′ S., long. 146° 00′ E., and thence to lat. 9° 00′ S., long. 145° 10′ E. At this point, turn sharply to the westward, to enter the Great North-east channel at Bligh entrance, passing southward of Bramble cay (beacon visible about 10 miles in clear weather) at a distance of five miles.

For directions thence through the reefs to Torres strait and Thursday island, *see* Australia Pilot, Vol. III. Also *see* Admiralty Charts upon which appears the track recommended.

See Australia Pilot, Vols. III and IV, for passage to Thursday island (Torres strait) by Inner route.

Distance from Sydney to Cooktown, 1,313 miles; to Rockhampton, 794 miles; to Thursday island by (a), 1,720 miles; by (b) (i), 1,965 miles; by (b) (ii), 2,050 miles; to Townsville, 1,080 miles.

Route 508. Sydney to Singapore

There are two routes either east-about via Thursday island, or west-about via Cape Leeuwin. The former is about 80 miles shorter and better weather can be expected; it is the route usually adopted.

(a) Via Thursday island.—Take Route 507 (a) to Thursday island and thence Route 443 (a), (b), or (c) to Singapore.

(b) Via Cape Leeuwin.—Take Route 497 (3) to Cape Leeuwin and thence, after rounding the cape, join Route 460, Fremantle to Singapore. *See* General directions for rounding Cape Leeuwin under Route 452, and Caution under Route 463.

Distance from Sydney to Singapore by (a), using 443 (a), 4,266 miles; using 443 (b), 4,224 miles; using 443 (c), 4,544 miles; by (b), 4,304 miles.

Note.—A call at Fremantle on route (b) adds only about 60 miles to the total distance.

Route 509.—*Reserved as spare.*

Route 510. Sydney to Balik Papan or Tarakan (Borneo)

(1) To BALIK PAPAN.—Passage may be made east-about via Thursday island, or west-about via Cape Leeuwin. The former is over 500 miles shorter.

(a) Via Thursday island.—Take Route 507 (a) to Thursday island and thence by either of the two following routes.

(i) Steer through the Arafura sea and Wètar straat and thence along the northern shore of Flores to about long. 121° E.; thence past Tana Djampea to round the northern end of Postiljon eilanden. Thence pass through the Java sea and Strait of Macassar to destination. (*See* Australia Pilot, Vols. III, IV and V., and Eastern Archipelago Pilot, Vol. II.)

Note.—By continuing along the northern coast of Flores and Soembawa, turning northward into the Java sea to the westward of the Paternoster eilanden, the distance is increased by about 60 miles.

(ii) An alternative track to proceeding along the northern coast of Flores, after leaving Wètar straat, is to proceed direct to the north-eastern entrance of Saleier straat, thence through the strait and round the southern end of Celebes and thence through Macassar strait, passing westward of the Spermonde archipel and north-eastward of the Kleine Paternoster eilanden. This track shortens the distance between Thursday island and Balik Papan by about 25 miles.

(b) Via Cape Leeuwin.—Take Route 497 (3) to Cape Leeuwin, and thence, rounding the Cape, proceed as direct as navigation permits to Lombok straat; thence continue through Java sea and Macassar strait to destination. *See* Australia Pilot, Vols. II, I, and V, and Eastern Archipelago Pilot, Vol. II.

(2) To TARAKAN

(a) S.E. Monsoon.—Take Route 511 (a) (i) as far as Bangka straat and then proceed as direct as navigation will permit to Tarakan.

(b) Alternative route (All seasons).—Take (1) (a) (i) or (ii) above as far as Balik Papan, and thence to Tarakan. The distance from Balik Papan to Tarakan is 378 miles.

Distance from Sydney to Balik Papan by (1) (a) (i), 3,477 miles; by (1) (b), 4,007 miles; to Tarakan by (2) (a), 3,516 miles.

Route 511. Sydney to Manila

There are two principal routes, an Inner route, through the Eastern archipelago, and an Outer Route, eastward of New Guinea and the Philippine islands.

The Inner route is that usually followed, and has two variants, according to monsoon.

(a) Inner route.

(i) S.E. Monsoon (May to September).—Take Route 507 (a) to Thursday island, and thence pass through the Timor or Arafura sea and into the Banda sea between the Tanimbar eilanden and the Aroe eilanden. Thence proceed across the eastern part of the Banda sea, through Manipa straat and the passage between Obi Major and the eastern end of the Soela eilanden into the Molucca sea. Thence pass through Bangka straat close northward of the north-eastern extreme of Celebes, and thence through Basilan strait into the Sulu sea. Steer across the Sulu sea and through Mindoro strait and thence to Manila as directly as navigation permits.

(ii) N.E. Monsoon (December to March).—Take Route 507 (a) to Thursday island.—From Thursday island, pass to the eastward of and round the north end of the Aroe eilanden, then northward of Ceram and eastward of Halmahera, through the Djailolo passage, into open water. Thence pass along the eastern coast of Mindanao and around its north end through the Surigao strait into the Sulu sea. *See* Note below, respecting eastern ports of Mindanao.

Pass along the eastern side of Mindoro island and then along the northern coast of the same island, through the Verde Island passage into the China sea, and thence continue as direct as navigation permits to destination.

Verde Island passage.—Vessels will find the route east of Lubang island, through Verde Island passage and along the east coast of Mindoro, preferable to that through Mindoro strait. The whole track is clear, but caution must be used in the vicinity of Bakos islets, south-east of Verde island. This is a favourite route during the North-East Monsoon for vessels coming from the southward, which get north under the lee of Negros and Panay, and from the north-west point of Panay proceed between Mindoro and Tablas island to Dumali point, and then on through Verde Island passage and up the west coast of Luzon, thus escaping the strong monsoon that is generally felt on clearing Lubang islands.

Note.—Steamers from the Sulu sea making for ports on the east coast of Mindanao use the eastern or Hinatuan passage between Dinagat and Bukas islands and the main coast of Mindanao.

(b) Outer route.

Take Route 512 (b) (i) as far as Yap, or 512 (b) (ii) as far as Guam. From either of these islands, take a Great Circle track to the entrance of San Bernardino strait, and pass into the China sea by the Verde Island passage. Thence continue to Manila as directly as navigation permits.

Note.—For Routes (a) (i), and (a) (ii) above *see* Australia Pilot, Vols. III and IV, Eastern Archipelago Pilot, Vols. III and I, and China Sea Pilot, Vol. II. *Also see* Navigation Note under Route 722.

Distance from Sydney to Manila by (a) (i), 3,915 miles; by (a) (ii), 3,883 miles; by (b), via Yap, 4,241 miles; via Guam, 4,571 miles.

Route 512. Sydney to Hong Kong

There are three routes: (a), an Inner route, or (b) Outer routes (i), via Yap, or (ii), via Guam.

(a) Inner route.—This is the usual route.

(i) S.E. Monsoon (May to September).—Take Route 511 (a) (i) as far as Mindoro strait, and thence proceed direct to Hong Kong.

(ii) N.E. Monsoon (December to March).—Take Route 511 (a) (ii) as far as Verde Island passage, and thence proceed direct to Hong Kong.

See also Route 700.

(b) Outer route. (i) via Yap.—After clearing Port Jackson, steer up the coast as far as abreast of Cape Byron, and from that point make a direct course so as to pass about 30 miles westward of Wreck reef, and 20 miles eastward of Frederick reef, to a position lat. 21° 00′ S., long. 154° 50′ E. *(See* Australia Pilot, Vol. III.)

From this point steer a direct course so as to pass midway between Rossel spit (Adele islet), the extreme eastern point of the Louisiade archipélago, S.E. of Papua, and Pocklington reef. The distance between these two points is about 75 miles.

From this point, steer to pass through the strait between New Ireland and the Solomon islands *(see* Pacific Islands Pilot, Vol. I.) Having cleared Lyra reef, take a direct course for Yap island, passing 20 miles south-westward of Sorol, or Philip islands. *(See* Pacific Islands Pilot, Vol. I.) From Yap, steer direct for the Balintang channel northward of the Philippine islands. *(See* China Sea Pilot, Vol. III).

From Balintang channel steer direct for Hong Kong on a route which is clear of all dangers. *(See* China Pilot, Vol. I.)

Note.—The above route may be varied by passing through the Bougainville strait, instead of between the Solomon islands and New Ireland. The distance is practically the same, namely, 4,693 miles.

(ii) Via Guam.—After clearing Port Jackson, steer along the coast to the northward as far as Sugar Loaf point. From this position, lay a course to pass 30 miles eastward of Cato island, and thence for a position lat. 20° 00′ S., long. 156° 30′ E., passing about 30 miles eastward of Kenn reef *(See* Australia Pilot, Vol. III.)

From this point, steer a direct course for Bougainville strait, Solomon islands, passing 30 miles eastward both of Mellish reef and of Pocklington reef. After clearing the strait, make for the island of Guam, passing through the Caroline islands at 20 miles westward of Ulul island. *(See* Pacific Islands Pilot, Vol. I.) From Guam, take the Great Circle track to a position lat. 21° 20′ N., long. 121° 00′ E., in the

Bashi channel southward of Formosa *(See* China Sea Pilot, Vol. III); and thence direct to destination.

Distance from Sydney to Hong Kong via (a) (i), 4,449 miles; via (b) (i), 4,683 miles; via (b) (ii), 4,874 miles.

Distance from Sydney to Guam, 3,074 miles; to Yap, 3,085 miles.

Route 513. Sydney to Shanghai

There are two main routes, namely, through the Eastern archipelago, or east of New Guinea. The former is sub-divided into two routes to be used according to season, while the latter can be taken via Yap or Guam.

(a) Through Eastern archipelago.

(i) S.E. Monsoon (May to September).—Take Route 511 (a) (i) until abreast of Manila. Thence steer as directly as navigation permits up the west coast of Luzon and across to make the South point of Formosa. Steer up the eastern coast of Formosa, in the strength of the Kuro shio current, here setting to the northward, and after passing Agincourt island, steer for Steep Island passage, and pass through it to destination.

(ii) N.E. Monsoon (December to March).—Take Route 511 (a) (ii) until reaching open water after passing through Djailolo passage; thence steer direct to a position in lat. 22° 55′ N., long. 122° 40′ E., passing about 25 miles west of the charted position of Anson shoal. Thence steer direct for Steep Island passage and thence to destination.

Notes.—Anson shoal has been searched for unsuccessfully. *See* Eastern Archipelago Pilot, Vol. I.

A description of many of the channels through the Eastern archipelago mentioned in Route 509 to 513, will be found in Chapter II of Section C, Part II.

(b) East of New Guinea.

(i) Via Yap.—Take Route 512 (b) (i) as far as Yap. Thence take the Great Circle track to a position lat. 25° 30′ N., long 126° 30′ E., midway between Okinawa guntō and Sakishima guntō; and from thence steer direct to Steep Island passage and thence to destination.

(ii) Via Guam.—Take Route 512 (b) (ii) to Guam. Thence take the Great Circle track to a position lat. 25° 30′ N., long. 126° 30′ E., midway between Okinawa guntō and Sakishima guntō; and from thence, steer direct to Steep Island passage, and thence to destination.

This track passes about 40 miles south-westward of Parece Vela, or Douglass reef (10 feet ($3^{m}0$) high). *(See* Pacific Islands Pilot, Vol. I

Distance from Sydney to Shanghai, by (a) (i), 5,043 miles; by (a) (ii), 4,861 miles; by b (i), 4,721 miles; by (b) (ii), 4,758 miles.

Route 514. Sydney to Yokohama

There are two principal routes as far as the Caroline islands where they join.

(a) Take Route 512 (b) (ii) through Bougainville strait and then steer to cross equator at long. 154° 00′ E., and pass through the Caroline islands midway between Saijō bank and Gray Feather bank on the west, and Ulul, the westernmost of the Namonuito group, on the east; distant about 20 miles from each. *(See* Pacific Islands Pilot, Vol. I.) After passing Ulul island, take a track slightly curving to the eastward, but otherwise as directly as possible for Yokohama, so as to pass not less than 20 miles eastward of the chain of the Ladrone (or Mariana) islands and of the Ogasawara guntō. *(See* Pacific Islands Pilot, Vol. I), and Japan Pilot, Vol. II.

(b) Take Route 512 (b) (i), through the strait between New Ireland and the Solomon islands, and thence proceed direct to pass through the Caroline islands, as described above, joining (a) above off Ulul. This reduces the whole distance to Yokohama by about 50 miles.

Distance from Sydney to Yokohama by (a), 4,379 miles.

Note.—A call at Guam lengthens the distance by 51 miles only.

Route 515. Sydney to Hakodate

Take Route 514 (a) or (b) as far as Ulul in the Caroline islands, and thence steer direct to round the eastern extreme of Honshū; thence proceed to Hakodate as directly as navigation permits. *See* Japan Pilot, Vol I.

CAUTION. *See* remarks on tidal streams and currents off the east coast of Japan, and in Tsugaru kaikyō when approaching Hakodate, to be found in Japan Pilot, Vol. I.

See also remarks on *ice* in Japan Pilot, Vol. I and in Part IV, Chapter I.

Distance from Sydney to Hakodate, 4,687 miles.

Route 516. Sydney to Vladivostok

Take Route 514 (a) or (b) as far as Ulul in the Caroline islands, and thence steer direct for Bungo suidō. Thence proceed through the Naikai (Inland sea) to Shimonoseki kaikyō and thence as direct as navigation permits to destination.

See Japan Pilot, Vol. II for directions through Naikai.

Distance from Sydney to Vladivostok, 5,014 miles (by 514 (b)).

Note.—If desired the passage may be taken via Hakodate and Tsugaru kaikyō. The distance is about 100 miles greater.

CAUTION. *Ice. See* S. and E. coast of Korea, E. coast of Siberia, and Sea of Okhotsk Pilot, and paragraphs on ice in Part IV, Chapter I.

Route 517. Sydney to Petropavlovsk

Take Route 512 (b) (ii) as far as Bougainville strait. Thence proceed direct to destination, crossing the Equator in about long. 156° 30′ E., and passing through the East Caroline islands between Oroluk lagoon and the Senyavin islands.

CAUTION. *Ice.*—Petropavlovsk is ice-bound between October and May. *See* South and East coast of Korea, East coast of Siberia, and Sea of Okhotsk Pilot.

Distance from Sydney to Petropavlovsk, 5,257 miles.

Note.—If desired the passage may be made via Guam. *Distances* are as follows:—Sydney to Guam, 3,074 miles *(See* Route 512 (b) (ii)); Guam to Petropavlovsk (direct), 2,480 miles. *Total distance* Sydney to Petropavlovsk, 5,554 miles.

Route 518. Sydney to Dutch harbour

Take Route 504 (1) (a) or (b) to Honolulu, and thence Route 601 to Dutch harbour.

Distance from Sydney to Honolulu, 4,518 miles; to Dutch harbour, 6,555 miles.

Route 519.—*Reserved as spare.*

Route 520. Sydney to ports in British Columbia

(1) To Prince Rupert.

(a) Direct route.—Take Route 504 (1) (b) as far as the Equator in long. 178° 50′ W., and thence take a Great Circle track to a position in lat. 54° 22′ N., long. 133° 10′ W., in Dixon entrance. From this point proceed as directly as navigation permits to destination.

Notes.—The above Great Circle passes through the Hawaiian islands eastward of French Frigate shoal.

The direct passage may be made also via Hecate strait; in this case the Great Circle track will pass through the Hawaiian islands eastward of Necker island.

(b) Via Honolulu or Suva and Honolulu.—Take Route 504 (1) (a) or (b) to Honolulu and thence take the Great Circle track to Dixon entrance or to Hecate strait. Thence continue as directly as navigation permits to destination. *See* Note under (2) (b) below.

(2) To VANCOUVER.

(a) Direct route.—Proceed as in (1) (a) above to the Equator and thence take a Great Circle track to a position in lat. 48° 30′ N., long. 124° 45′ W., in Juan de Fuca strait, and thence continue as directly as navigation permits. *See* Navigational Notes and Cautions under Route 741 (b).

Note.—The Great Circle track passes about 25 miles to the eastward of the reported position of Wilder shoal, and passes through the Hawaiian islands to the eastward of Nihoa.

(b) Via Honolulu or Suva and Honolulu.—Take Route 504 (1) (a) or (b) to Honolulu, and thence take a Great Circle track to Juan de Fuca strait as in (2) (a) above.

Note.—Routes (1) (b) and (2) (b) are provided for vessels with only a moderate radius of action; the longest uninterrupted run, if calling at Suva and Honolulu, is 2,785 miles between these two ports. Coal burning vessels may make an additional call at Apia in the Samoa islands. This increases the total distance by about 120 miles, but the longest leg on the passage is 2,395 miles (Honolulu to Prince Rupert) or 2,420 miles (Honolulu to Vancouver).

Distances from Sydney are:—

To Prince Rupert by (a), 6,835 miles; by (b), using 504 (1) (a), 6,913 miles; by (b), using 504 (1) (b), 6,938 miles.

To Vancouver by (a), 6,929 miles; by (b), using 504 (1) (a), 6,938 miles; by (b), using 504 (1) (b), 6,963 miles.

CAUTION. *See* remarks on Currents, Fogs, Kelp, etc., under Route 741.

Route 521. Sydney to San Francisco or San Diego—*See Note regarding Fogs under Routes* 740 *and* 741.

Any one of the following four routes may be taken, the choice depending on the radius of action of the vessel. Route (d) is recommended for vessels with a small bunker capacity. It can be varied by calling at Apia on the passage from Suva to Honolulu; only small stocks of coal, but no oil fuel, are available at Apia. The total distance is increased by 123 miles by this variation, but the longest unbroken portion of the passage is 2,275 miles instead of 2,783 miles.

(a) Via Honolulu.—Take Route 504 (1) (b) to Honolulu, and thence follow a Great Circle track to either San Francisco or San Diego.

(b) Via Suva.—Take Route 503 (1) to Suva, and thence a Great Circle direct to San Francisco or San Diego.

(c) Via Apia.—Take Route 503 (2) to Apia, and thence a Great Circle as in (a) or (b).

(d) Via Suva and Honolulu.—Take Route 504 (1) (a) to Honolulu via Suva and continue thence as in (a). See remarks above regarding a call at Apia.

Distances from Sydney are:—

To San Francisco by (a), 6,636 miles; by (b), 6,492 miles; by (c), 6,521 miles; by (d), 6,609 miles.

To San Diego by (a), 6,813 miles; by (b), 6,546 miles; by (c), 6,553 miles; by (d), 6,793 miles.

Route 522. Sydney to Panama

Take one of the following four routes according to the vessels' radius of action, route (d) being for vessels with a small radius of action.

(a) Via Wellington.—Follow Route 500 to Wellington and there join Route 593 (2) (a), Wellington to Panama.

(b) Via Tahiti.—Take Route 502 to Tahiti and there join Route 593 (2) (b), Wellington to Panama.

(c) Via Suva (direct) or via Suva and Tahiti.—Take Route 503 (1) to Suva, and there join Route 553 (a), or 553 (b) to Panama.

(d) Via Suva, Honolulu, San Diego, and Manzanillo.—Take 504 (1) (a) to Honolulu via Suva (Route 503 (1) as far as Suva). Thence take a Great Circle track to San Diego, and thence steer along the coast to Manzanillo and Panama.

Distances from Sydney to Panama:—

By (a).—Sydney to Wellington, 1,233 miles; Wellington to Panama, 6,533 miles. *Total distance*, 7,766 miles.

By (b).—Sydney to Tahiti, 3,304 miles; Tahiti to Panama, 4,570 miles. *Total distance*, 7,874 miles.

By (c).—Sydney to Suva, 1,735 miles; Suva to Panama, 6,302 miles. *Total distance*, 8,037 miles.

Sydney to Suva, 1,735 miles; Suva to Tahiti, 1,835 miles; Tahiti to Panama, 4,570 miles. *Total distance*, 8,140 miles.

By (d).—Sydney to Suva, 1,735 miles; Suva to Honolulu, 2,783 miles; Honolulu to San Diego, 2,275 miles; San Diego to Manzanillo, 1,128 miles; Manzanillo to Panama, 1,719 miles. *Total distance*, 9,640 miles.

Note.—By calling at Apia (Samoa islands) the passage from Suva to Honolulu is divided into two parts of 644 miles and 2,262 miles. This makes the longest leg on route (d) 2,275 miles, Honolulu to San Diego. The total distance is increased by 123 miles. Only coal is available at Apia.

Route 523. Sydney to Callao

Take Route 500 to Wellington and there join Route 594, Wellington to Callao.

Distance from Sydney to Callao, 6,950 miles.

Note.—By not calling at Wellington the total distance is reduced by about 20 miles.

Route 524. Sydney to Iquique or Valparaiso

Take Route 500 to Wellington to join Route 595 (1), Wellington to Iquique or Valparaiso.

Distance from Sydney to Iquique, 6,882 miles; to Valparaiso, 6,291 miles.

Note.—By not calling at Wellington the total distance is reduced by about 20 miles.

Route 525. Sydney to Estrecho de Magallanes (Magellan strait) and Cabo de Hornos (Cape Horn)

See remarks on Ice on pages 40 and 126.

Two routes may be taken, one direct, around the South Cape of New Zealand; the other via Cook strait, calling at Wellington for bunker replenishment.

(a) Direct route—After clearing Port Jackson, take the Great Circle track to a position lat. 47° 50′ S., long. 167° 50′ E., midway between The Traps and The Snares, off the South point of Stewart island, New Zealand. From this point, steer on a second Great Circle track to a position lat. 48° 30′ S., long. 165° 00′ W. Thence continue on Rhumb lines, by the Southern route, Route 485, to a position lat. 52° 45′ S., long. 100° 00′ W.

Thence proceed on a Rhumb line either to Cabo Pilar (Cape Pillar) at entrance of Estrecho de Magallanes, or to lat. 56° 40′ S., long. 67° 00′ W., passing about 20 miles southward of Islas Diego Ramirez, and thence north-eastward past Cabo de Hornos.

(b) Via Wellington.—First take Route 500 to Wellington. From Wellington take the Great Circle track to the position lat. 49° 30′ S., long. 150° 00′ W. to join (a) above. By not calling at Wellington the total distance is reduced by about 20 miles.

Distances from Sydney are:—

To the position off The Snarcs, 1,121 miles.

To Cabo de Hornos (Cape Horn), by (a), 5,865 miles; by (b), 5,853 miles.

To Cabo Pilar (Estrecho de Magallanes), by (a), 5,639 miles; by (b), 5,627 miles.

Route 526. Sydney to Bishop rock (English channel)

Four routes may be taken, two eastward, via Panama, or via Estrecho de Magallanes (Magellan strait), and two westward, via Aden, or via Cape of Good Hope.

(a) Via Paanma.—Take Route 522 to Panama and, after passing through the canal to Colon, take the reverse of Route 41 (2) or (3), to Bishop rock.

(b) Via Estrecho de Magallanes.—Take Route 525 to Estrecho de Magallanes and, after passing through the strait, take Route 278 to Pôrto de Recife, and from thence the reverse of Route 45 (1) to Bishop rock.

(c) Via Aden.—Take Route 497 (3) to Fremantle, and thence Route 457 to Aden. From Aden take Route 302 to Suez and, having passed through the canal, take Route 290, from Port Said to Gibraltar; from thence take Route 80 to Bishop rock.

Note.—If no calls are to be made on the passage to Aden, a vessel should consider making the voyage via Thursday island, especially in winter, to avoid the bad weather across the Australian bight. The distance is about 820 miles more, but *see* Route 447 (c).

(d) Via Cape Town.—Take Route 497 (2) as far as Cape Otway, to join Route 472, Melbourne to Cape Town; thence take Route 156 to Bishop rock.

Distances from Sydney to Bishop rock.

Via Panama, 12,157 miles; via Aden, 11,198 miles; via Estrecho de Magallanes, 12,852 miles; via Cape Town, 11,976 miles.

Route 527.—*Reserved as spare.*

Route 528. *Reserved as spare.*

(iv) ROUTES FROM BRISBANE

Route 529. Brisbane to Sydney

After clearing the approaches to Brisbane, steer to the southward along the coast, well outside all bights, so as to take advantage of the current, which generally sets to the southward at from one to three knots.

The usual rule is not to allow the land to " dip," when making to the southward.

Distance from Brisbane to Sydney, 515 miles.

Route 530. Brisbane to Tasmania, Victoria, South and West Australia

Take Route 529 to Sydney and thence by Route 497 to Melbourne, Adelaide, Albany, and Fremantle, or by Route 498 to Hobart.

Distance from Brisbane to Adelaide, 1,471 miles; to Albany, 2,316 miles; to Fremantle, 2,638 miles; to Hobart, 1,132 miles; to Melbourne, 1,080 miles.

Route 531. Brisbane to Thursday island

See General remarks in Route 507.

(a) Inner route.

After clearing the entrance to Moreton bay, stand to the northward, and after rounding Sandy cape, and passing Breaksea spit and Sandy cape shoal *(see* Australia Pilot, Vol. III) enter the Inner Route at Curtis channel, or Capricorn channel. Thence proceed as in Route 507 (a).

(b) Outer route.

(i) Via Raine Island entrance.—After leaving Moreton bay, steer a direct course for a position lat. 21° 00′ S., long. 154° 40′ E., about 20 miles eastward of Frederick reef (or, if preferred, so as to pass 20 miles eastward of Saumarez reef and 20 miles westward of Frederick reef). From this point, steer to round Lihou reef at about 50 miles distance, and for a position in lat. 15° 30′ S., long. 152° 00′ E.; there join Route 507 (b) (i).

(ii) Via Great North-east channel.—Proceed as in (b) (i) to the position in lat. 15° 30′ S., long. 152° 00′ E., and thence as in Route 507 (b) (ii).

Distance from Brisbane to Thursday island, by (a), 1,317 miles; by (b) (i), 1,615 miles; by (b) (ii), 1,702 miles.

Route 532. Brisbane to Port Darwin

Take any of the above three routes to Thursday island (the Inner Route being that recommended) and thence as direct as navigation permits to Port Darwin, passing either northward of Melville island, or southward of it through Howard channel, Clarence strait.

Distance from Brisbane to Port Darwin, passing northward of Melville island, 2,160 miles; southward of Melville island, 2,050 miles. In both cases it is assumed that the Inner route to Thursday island has been used.

Route 533. Brisbane (or Sydney) to Cape Town, Durban or Mombasa

The passage may be made either south-about via Bass strait and Fremantle, or north-about, via the Inner route and Thursday island. The south-about route is the shorter, but consideration must be given to the weather that can be expected in various seasons.

(1) To CAPE TOWN OR DURBAN.

(a) Via Bass strait and Fremantle.—Take Route 529 to Sydney, and thence Route 497 (3) to Fremantle; thence take Route 454 to Durban or Cape Town.

(b) Via Inner route and Thursday island.—Take Route 531 (a) to Thursday island; thence take Route 445 to Durban or Cape Town.

(2) To MOMBASA.

(a) Via Bass strait and Fremantle.—Take Route 529 to Sydney, and thence Route 497 (3) to Fremantle. From Fremantle proceed on one of the following routes.

Direct.—Take a Great Circle track direct to Mombasa. The track crosses Nazareth bank (*See* South Indian Ocean Pilot) about 30 miles north-eastward of Albatross island; it passes very close to the charted position of Rajaswaree shoal *(See* South Indian Ocean Pilot), and thence southward of the Farquhar group, and northward of the Cosmoledo group.

(ii) Via Mauritius.—Take Route 455 to Mauritius, and thence Route 353 to Mombasa.

(b) Via Inner route and Thursday island.—Take Route 531 (a) to Thursday island and thence proceed as directly as navigation permits to a position in lat. 11° 30′ S., long. 118° 00′ E., and thence take a Rhumb line track direct to lat. 8° 00′ S., long. 68° 00′ E. From this point steer to pass northward of Saya de Malha bank, and southward of Coetivy island and St. Francis island; thence proceed as directly as navigation permits to Mombasa.

Distance from Brisbane:—

To Cape Town, via (1) (a) (taking 454 (a)), 7,858 miles; via (1) (a) (taking 454 (b)), 7,778 miles; via (1) (b), 8,298 miles.

To Durban, via (1) (a) (taking 454 (a)), 7,057 miles; via (1) (a) (taking 454 (b)), 6,979 miles; via (1) (b), 7,652 miles.

To Mombasa, via (2) (a) (i), 7,201 miles; via (2) (a) (ii), 7,271 miles; via (2) (b), 7,417 miles.

Distances from Sydney are.—Via Fremantle 500 miles *less* or via Thursday island 403 miles *more* than those given above.

Route 534. Brisbane (or Sydney) to Aden

Passage may be made either south-about via Fremantle, or north-about via Thursday island. The latter, taking the shortest seasonal route in each case, is a little more than 230 miles the shorter of the two (from Brisbane).

(a) Via Fremantle.—Take Route 530 to Fremantle, and thence Route 457 to Aden.

(b) Via Thursday island.—Take Route 531 (a) to Thursday island, and thence Route 447 to Aden.

Distance from Brisbane to Aden by (a), 7,561 miles; by (b), 7,329 miles.

For distance from Sydney, *deduct* 500 miles via Fremantle, or *add* 403 miles via Thursday island.

Route 535. Brisbane (or Sydney) to Colombo or Singapore

The passage may be made either south-about via Fremantle, or north-about via Thursday island (and, in the case of Singapore, either southward and westward of Java, or northward of Java). The route via Thursday island is, in each case, considerably the shorter.

(a) Via Fremantle.—Take Route 530 to Fremantle, and thence Route 456 to Colombo, or Route 460 to Singapore.

(b) Via Thursday island.—Take Route 531 (a) to Thursday island, and thence Route 446 to Colombo, or Route 443 to Singapore.

Distance from Brisbane to Colombo by (a), 5,759 miles; by (b), 5,293 miles; to Singapore by (a), 4,861 miles; by (b), 3,821 miles.

For distance from Sydney *deduct* 500 miles via Fremantle, or *add* 403 miles via Thursday island.

Route 536. Brisbane to ports in Arabian sea, Persian gulf, Bay of Bengal, Eastern Archipelago, Hong Kong and China sea

(1) To ARABIAN SEA OR PERSIAN GULF.—Proceed via Route 531 (a) to Thursday island, and thence by Route 446 to Colombo; from Colombo take Route 400 to Persian gulf, or Route 401 to Bombay or Karāchi. If not calling at Colombo take Route 448 from Thursday island.

(2) To PORTS IN BAY OF BENGAL.—Take Route 531 (a) to Thursday island and thence Route 443 to Singapore. If not calling at Singapore take one section of Route 449 to destination, noting that 449 (1) (a) and (2) (a) contain the shortest route to Calcutta or Madras. To Rangoon, Route 449 (3) should be taken.

(3) To HONG KONG, PORTS IN EASTERN ARCHIPELAGO AND CHINA SEA.—Take Route 531 (a) to Thursday island and thence as described in Routes from Sydney; 510 (1) (a) to Balik Papan or 510 (2) (a) to Tarakan, 511 (a), (i) or (ii) to Manila, 512 (a) to Hong Kong and China sea.

Note.—The passage to Hong Kong may be made by joining Route 512 (b) (i), west of Bougainville island, or Route 512 (b) (ii) at Bougainville strait.

Distances from Brisbane are:—

To Arabian sea and Persian gulf.—To Bombay, 6,161 miles; to Fao, 7,563 miles; to Karāchi, 6,613 miles.

To ports in Bay of Bengal.—To Calcutta, 5,471 miles; to Madras, 5,407 miles; to Penang, 4,197 miles; to Rangoon, 4,938 miles.

To Hong Kong, ports in Eastern archipelago, and China sea.—To Ambon, 2,269 miles; to Amoy, 3,986 miles; to Balik Papan, 3,074 miles; to Bangkok, 4,513 miles; to Djakarta (Batavia), 3,466 miles; to Hong Kong, 4,046 miles; to Manila, 3,512 miles; to Saigon, 4,102 miles; to Shanghai, *see* Route 537; to Tarakan, 3,113 miles.

Route 537. Brisbane to Shanghai

There are two main routes, namely, through the Eastern archipelago, or east of New Guinea. The former is divided into two routes to be used according to season, while the latter can be taken via Yap, or via Guam. Details of the routes will be found in Route 513, Sydney to Shanghai, which should be joined as follows:—

Route 513 (a) (i) or (ii) at Thursday island *(See* Route 531 (a)).

Route 513 (b) (i).—Off Frederick reef.

Route 513 (b) (ii).—At Bougainville strait (reached by steering as directly as navigation permits from the position off Frederick reef).

Distance from Brisbane to Shanghai via 513 (a) (i), 4,634 miles; via 513 (a) (ii), 4,458 miles; via 513 (b) (i), 4,221 miles; via 513 (b) (ii), 4,325 miles.

Route 538. Brisbane to Yokohama, Hakodate or Vladivostok

In each case steer to join Route 514 (a) at Bougainville strait *(See* Route 537), or Route 514 (b), off Frederick reef. Thence follow Route 514 to Yokohama, 515 to Hakodate, or 516 to Vladivostok.

Distance from Brisbane (joining Route 514 (a) at Bougainville strait) to Yokohama, 3,980 miles; to Hakodate, 4,324 miles; to Vladivostok, 4,682 miles.

By joining Route 514 (b) at Frederick reef, the distances are reduced by about 50 miles.

Route 539.—*Reserved as spare.*

Route 540. Brisbane to Honolulu (Hawaiian islands)

After clearing Moreton bay, steer to pass about 20 miles westward of Cato island, and the same distance eastward of Bird island or Wreck reef. Round the N.W. point of Bampton reef at about 30 miles distance, and steer thence to pass midway between Vanikoro island (the southernmost of the Santa Cruz group) and Torres island, the northernmost of the Banks islands. The distance between the two islands is about 80 miles, and the water deep. Cross the meridian of 170° E., at lat. 10° S., and take a direct Rhumb line to cross the Equator in 178° 50′ W., passing 50 miles northward of Nanumea, the northernmost of the Ellice islands, and 50 miles southward of Aroræ, or Hurd island, the southernmost of the Gilbert islands.

From the Equator steer on a Rhumb line to Honolulu. *See* also Route 553 for passage for vessels with a small radius of action.

Distance from Brisbane to Honolulu, 4,139 miles.

Route 541. Brisbane to Nouméa (New Caledonia)

Proceed on the direct Rhumb line track, passing midway between Kelso bank and Capel bank (no known dangers on them) at a distance of about 30 miles from each.

Distance from Brisbane to Nouméa, 825 miles.

Route 542. Brisbane to Suva (Fiji islands)

From Moreton bay take a Rhumb line track direct to a position in lat. 23° 00′ S., long. 170° 00′ E. This track passes close to the 28 fathoms (51$^{\text{m}}$2) (reported 1944), but well clear of other reported shoals to the south, and south-east of New Caledonia. From the above position steer first for a point about half way between Matthew and Hunter islands, and then on a Rhumb line direct to Kandavu passage, and thence to Suva.

Distance from Brisbane to Suva, 1,560 miles.

Route 543. Brisbane to Tongatapu (Tonga or Friendly islands)

After clearing Moreton bay, take the direct Great Circle track to destination, crossing the meridian of 160° E. at lat. 26° 20′ S., 170° E. at 24° 50′ S., and 180° at 22° 30′ S. The route is quite clear of all dangers.

Distance from Brisbane to Tongatapu, 1,827 miles.

Route 544. Brisbane to Apia (Samoa islands)

There are two routes, one direct and the other via Suva; the former is about 30 miles shorter.

(a) Direct.—After clearing Moreton bay, take the Great Circle track to Vatoa, or Turtle island (*Lat. 19° 50′ S., Long. 178° 10′ W.*), one of the southern islands of the Fiji group. The track crosses the meridian of 160° E. at 25° 45′ S.; and 170° E. at 23° 20′ S. It then passes 20 miles southward of Hunter island, and about 15 miles southward of Conway reef, but close to the reported discoloured water about 110 miles to the eastward *(see* Pacific Islands Pilot, Vol. II).

On reaching lat. 20° 00′ S., 30 miles westward of Vatoa (which is 209 feet ($63^{m}7$) high) shape a direct Rhumb line course for Apolima strait, between Savaii and Upolu (Samoan islands) and thence to destination.

The track passes 20 miles northward of Curaçoa reef, northward of Tafahi island.

(b) Via Suva.—Take Route 542 to Suva, and thence proceed as directly as navigation permits to Apia.

Distance from Brisbane to Apia, by (a), 2,173 miles; by (b), 2,204 miles.

Route 545. Brisbane to Fanning island

Take Route 542 until it crosses the meridian of 168° 00′ E. in about 23° 30′ S., and there join Route 504 (b) (i), Sydney to Fanning island.

Distance from Brisbane to Fanning island, 3,405 miles.

Route 546. Brisbane to Tahiti or Rarotonga (Cook islands)

After clearing Moreton bay take the Great Circle track direct to Tahiti.

The track passes about 10 miles northward of Rarotonga (Cook islands) and 10 miles southward of Mauke; it crosses the various meridians as follows:—

160° E.,	at latitude	27° 00′ S.
170° E.,	,,	26° 40′ S.
180°	,,	25° 30′ S.
170° W.,	,,	23° 45′ S.
160° W.,	,,	21° 10′ S.

The track passes clear of all known dangers (about 10 miles to the southward of the discoloured water reported in 1944 in lat. 24° 06′ S., long. 172° 56′ W.), but there are few soundings along part of the track and care is advisable when navigating these waters.

Distance from Brisbane to Rarotonga, 2,637 miles; to Tahiti, 3,255 miles.

Route 547. Brisbane to Auckland

See Note as to Fog at the beginning of Sub-section (vi) of this chapter on page 140.

After clearing Moreton bay, take a Rhumb line track to pass 15 miles off Cape Maria Van Diemen, and thence to destination as directly as navigation permits.

This track passes 13 miles northward of Middleton reef, and 8 miles northward of the Three Kings rocks. It is recommended in preference to the Great Circle, which passes close to Middleton reef, while the saving in the whole distance is only two miles.

Distance from Brisbane to Auckland, 1,360 miles.

Route 548. Brisbane to Wellington

After clearing Moreton bay, take the Rhumb line track to a position lat. 40° 30′ S., long. 173° 55′ E., off the entrance to Cook strait. Thence proceed as directly as navigation permits through Cook strait to destination. The track passes about 30 miles eastward of Lord Howe island and Balls Pyramid.

There is a saving of three miles only in the whole distance by taking the Great Circle track, and it passes barely 10 miles clear of the above dangers.

Distance from Brisbane to Wellington, 1,446 miles.

See Note as to Fog at the beginning of Sub-section (vi) of this chapter on page 140.

Route 549. Brisbane to Bluff harbour

After clearing Moreton bay take the Rhumb line or Great Circle track (no practical difference in distance) for Solander island (1,095 feet ($333^{m}8$) high), at entrance to Foveaux strait, rounding Puysegur point at a safe distance. *See* New Zealand Pilot. Thence proceed as directly as navigation permits to destination.

Distance from Brisbane to Bluff harbour, 1,465 miles.

See Note as to Fog under Route 548.

Route 550.—*Reserved as spare.*

Route 551. Brisbane to British Columbia (Prince Rupert or Vancouver)

See Navigational Notes under Route 741.

There are two routes by which passage may be made; direct or via Honolulu.

(a) Direct.—Take Route 540 as far as the point where the track crosses the Equator in long. 178° 50′ W., to join Route 520 (1) (a) or (2) (a).

(b) Via Honolulu.—Take Route 540 to Honolulu and thence proceed as in Route 520 (1) (b) or (2) (b).

Distance from Brisbane to Prince Rupert, by (a), 6,432 miles; by (b), 6,531 miles; to Vancouver, by (a), 6,532 miles; by (b), 6,550 miles.

Route 552. Brisbane to San Francisco or San Diego

Take Route 540 to Honolulu, and thence take a Great Circle track to either destination. *See* Route 553 regarding passage for vessels with a very small radius of action.

See Note on Fogs under Route 740.

Distance from Brisbane to San Francisco, 6,230 miles; to San Diego, 6,414 miles.

Route 553. Brisbane to Mexico (West) and Panama

Passage may be made in a variety of ways, four of which are given below. The route via Suva and thence direct to Panama is the shortest, but the second section of the passage is 6,302 miles in length. Vessels with a very small radius of action can use the route via Suva, Honolulu, San Diego and Manzanillo (fuel oil only), on which the longest non-stop run is 2,783 miles from Suva to Honolulu; the latter can be sub-divided, if necessary, into two parts, Suva to Apia, 644 miles; Apia to Honolulu, 2,262 miles; this increases the total distance by 123 miles. *See* Route (d) below.

(a) Via Suva direct.—Take Route 542 to Suva; thence steer to pass through Nanuku passage and take a Great Circle track to a position in lat. 6° 30′ S., long. 120° 00′ E., to join Route 593 (2) (b), Wellington to Panama via Tahiti.

(b) Via Tahiti direct, or via Suva and Tahiti.—Take Route 546 direct to Tahiti, or Route 542 to Suva and thence Route 645, Suva to Tahiti. From Tahiti proceed as in Route 593 (2) (b), Wellington to Panama, via Tahiti.

(c) Via Wellington.—Take Route 548 to Wellington; from thence take Route 593 (2) (a) to Panama direct.

(d) Via Suva, Honolulu, San Diego, and Manzanillo.—Take Route 542 to Suva, and thence proceed as in Route 522 (d). *See* the remarks at the beginning of this route.

Distances from Brisbane to Panama.

By (a).—Brisbane to Suva, 1,560 miles; Suva to Panama, 6,302 miles. *Total distance*, 7,862 miles.

By (b).—Brisbane to Tahiti direct, 3,255 miles; Tahiti to Panama, 4,570 miles. *Total distance*, 7,825 miles. By calling at Suva and Tahiti the distances are: Brisbane to Suva, 1,560 miles; Suva to Tahiti, 1,835 miles; Tahiti to Panama, 4,570 miles. *Total distance*, 7,965 miles.

By (c).—Brisbane to Wellington, 1,446 miles; Wellington to Panama (direct), 6,533 miles. *Total distance*, 7,979 miles.

By (d).—Brisbane to Suva, 1,560 miles; Suva to Honolulu, 2,783 miles; Honolulu to San Diego, 2,275 miles; San Diego to Manzanillo, 1,128 miles; Manzanillo to Panama, 1,719 miles. *Total distance*, 9,465 miles.

Route 554. Brisbane to Callao, Iquique or Valparaiso

Proceed via Wellington, taking Route 548. From Wellington take Route 594 to Callao, or Route 595 (i) to Iquique or Valparaiso.

Distance from Brisbane to Wellington, 1,446 miles. Wellington to Callao, 5,717 miles. *Total distance*, 7,163 miles.

Wellington to Iquique, 5,649 miles. *Total distance*, 7,095 miles.

Wellington to Valparaiso, 5,058 miles. *Total distance*, 6,504 miles.

Route 555. Brisbane to Estrecho de Magallanes and Cabo de Hornos

Take Route 548 to Wellington and thence Route 595 (2) or (3) to destination.

Distance from Brisbane to Estrecho de Magallanes (Cabo Pilar), 5,840 miles; to Cabo de Hornos, 6,066 miles.

Route 556. Brisbane to Bishop rock (English channel)

Passage may be made eastward via Panama or via Estrecho de Magallanes (Magellan strait), or westward via Aden or via Cape Town.

(a) Via Panama.—Take Route 553 to Panama and, after passing through the canal, take the reverse of Route 41 (2) or (3) to Bishop rock.

(b) Via Estrecho de Magallanes.—Take Route 555 to Estrecho de Magallanes and, after passing through the strait, take Route 278 to Pôrto de Recife, and from thence the reverse of Route 45 (1) to Bishop rock.

(c) Via Aden.—Take Route 531 to Thursday island, and thence 447 to Aden. From Aden take Route 302 to Suez and, having passed through the canal, take Route 290 to Gibraltar, and thence Route 80 to Bishop rock.

If passage to Aden is made south-about via Fremantle the distance is increased by 230 miles, but that via Thursday island is recommended. *See* Route 447 (c).

(d) Via Cape Town.—Take Route 530 as far as Cape Otway to join Route 472, Melbourne to Cape Town; thence take Route 156 to Bishop rock.

Distances from Brisbane to Bishop rock:—

Via Panama, 12,253 miles; via Estrecho de Magallanes, 13,064 miles; via Aden, 11,618 miles; via, Cape Town, 12,474 miles.

Route 557.—*Reserved as spare.*

Route 558.—*Reserved as spare.*

(v) ROUTES FROM THURSDAY ISLAND

Routes from Thursday island to ports in the Indian ocean.—*See* Section B, Part III, Chapter V.

Routes to Australian ports.—*See* Route 444 and 507 (reversed).

Thursday island to Singapore.—*See* Route 443.

Route 559. Thursday island to Balik Papan or Tarakan

Take the relevant part of Route 510.

Distance from Thursday island to Balik Papan, 1,757 miles; to Tarakan, 1,796 miles.

Route 560. Thursday island to Manila

(a) During South-East Monsoon (May to September).—Take the relevant part of Route 511 (a) (i).

(b) During North-East Monsoon (December to March).—Take the relevant part of Route 511 (a) (ii).

Distance from Thursday island to Manila by (a), 2,195 miles; by (b), 2,163 miles.

Route 561. Thursday island to Hong Kong

(a) During S.E. Monsoon.—Take relevant part of Route 511 (a) (i) as far as Mindoro strait, and thence proceed direct to Hong Kong.

(b) During N.E. Monsoon.—Take relevant part of Route 511 (a) (ii) as far as Verde Island passage, and thence proceed direct to Hong Kong.

Distance from Thursday island to Hong Kong by (a), 2,729 miles; by (b), 2,697 miles.

Route 562. Thursday island to Yap or Guam

Take relevant part of Route 511 (a) (ii) as far as Djailolo passage, and thence proceed as directly as navigation will permit to either Yap or Guam.

Distance from Thursday island to Yap by (a) (ii), 1,742 miles; to Guam, 2,166 miles.

Note.—Passage may also be made round the Louisiade archipelago and between New Ireland and the Solomon islands, but the distance is about 250 miles longer to Guam and no less than 690 miles longer to Yap.

Route 563. Thursday island to Shanghai

Take relevant part of Route 513 (a), (i) or (ii), according to season.

Distance from Thursday island to Shanghai, by (a) (i), 3,323 miles; by (a) (ii), 3,141 miles.

Route 564. Thursday island to Yokohama

Either of the two routes below may be taken.

(a) Through the Eastern archipelago.—Take Route 511 (a) (i) as far as Djailolo passage and thence proceed as directly as possible to Yokohama.

(b) Via Bougainville strait.—Pass through Raine Island entrance or through Bligh entrance, and steer for and pass through either China strait, or through Jomard entrance, or steer to pass round the Louisiade archipélago. In either case proceed as directly as possible to Bougainville strait and join Route 514 (a) to Yokohama.

Distance from Thursday island to Yokohama, by (a), 3,240 miles; by (b), 3,707 miles.

Passage may also be made via Manila. The distance will be 4,010 miles, but during the South-East Monsoon a smoother passage over a considerable portion of the route may be expected.

Route 565. Thursday island to Honolulu or Fanning island

Two routes may be taken to Honolulu, the first being used also for Fanning island.

(a) Passing south of the Solomon islands.—After passing through the Raine Island entrance into the Coral sea steer to pass southward of the Indispensable reef, between the Santa Cruz islands and New Hebrides and between the Gilbert and Ellice islands; thence proceed to either destination as directly as navigation permits. *See* Route 504 (1) (b) for details of the passage from the position between the Santa Cruz islands and New Hebrides.

(b) Via Bougainville strait (to Honolulu only).—Pass through Bligh entrance and China strait, or Jomard entrance; thence proceed through Bougainville strait, and thence as direct as navigation permits to Honolulu.

Distance from Thursday island to Honolulu by (a), 4,295 miles; by (b), 4,178 miles (via China strait); to Fanning island by (a), 3,840 miles.

The distances in (a) above, may be shortened by about 30 miles by passing between Rennell island and (northward of) Indispensable reef.

Route 566. Thursday island to Suva (Fiji) or Apia (Samoa)

(1) To SUVA.—Pass through Raine Island entrance, and take a direct course to pass northward of Cape Cumberland, Espiritu Santo island (New Hebrides). Thence, after rounding the north point of Maewo island, steer to a position in lat. 15° 50′ S., long. 170° 00′ E., and thence direct to Kandavu passage, passing well south of the discoloured water reported in 1944 in lat. 15° 49′ S., long 170° 22′ E.

(2) To APIA.—From Raine Island entrance steer to pass either north or south of Banks islands. Thence steer to pass about midway between Hoorn islands and the shoal reported in 1944 to lie about 70 miles to the north-westward. From this point proceed direct for Apolima strait, and thence to Apia.

Distance from Thursday island to Suva, 2,206 miles; to Apia, 2,771 miles.

Route 567. Thursday island to Tahiti

After passing through Raine Island entrance, steer to round the north point of Espiritu Santo island (New Hebrides), and thence continue northward of Fiji islands to destination, passing about half way between Niua Fo'ou and Zephyr shoal, and south of Niuatoputapu.

Distance from Thursday island to Tahiti, 4,033 miles.

Route 568. Thursday island to Auckland or Wellington

Passage may be made either via Raine Island entrance and the Outer route, or via the Inner route (*see* Route 507), and Capricorn channel. The latter is the route usually followed; there is little difference in the distance to Auckland, but to Wellington the Inner route is over 50 miles shorter.

(a) Via Raine Island entrance.—Pass through Raine Island entrance, and take the Outer route to a position lat. 20° 00′ S., long. 156° 30′ E. Take as direct a course thence to destination as navigation permits. If for Auckland, pass 25 miles westward of Bellona shoals towards North cape of New Zealand. If for Wellington, steer for a position at the entrance of Cook strait, in lat. 40° 30′ S., long. 173° 55′ E.

(b) Via Inner route.—Take the Inner route along the Australian coast to Capricorn channel, and thence proceed to either destination as directly as navigation permits. Pass well north of Middleton reef if bound to Wellington.

Distance from Thursday island to Auckland by (a), 2,481 miles; by (b), 2,489 miles; to Wellington by (a), 2,666 miles; by (b), 2,612 miles.

Route 569. Thursday island to North American ports

Proceed via Honolulu (Route 565), taking a Great Circle track onwards to destination.

Distances from Thursday island: To Prince Rupert, 6,690 miles. To Vancouver, 6,715 miles. To San Francisco, 6,385 miles. To San Diego, 6,570 miles.

Note.—Vessels of small radius of action can make the passage to Honolulu via Suva and Apia; the distance is increased by about 120 miles, but the longest leg of the passage to Honolulu is only 2,260 miles between Apia and that port.

Route 570. Thursday island to Central American ports

Take passage via Suva (Route 566) or Tahiti (Route 567) or by a combination of any two of these. Passage onward is by Great Circle in each case, after clearing Samoa from Suva, or the north of Iles Marquises from Tahiti when bound to Manzanillo.

Bound to Panama take relevant part of Route 553 from Suva, or Route 593 (2) (b) from Tahiti.

Distances from Thursday island:—

To Manzanillo via Suva, 7,274 miles; via Tahiti, 7,528 miles. To Panama via Suva, 8,508 miles; via Tahiti, 8,603 miles.

Note.—Vessels of small radius of action can make the passage via Suva, Apia, Honolulu, San Diego, and Manzanillo (fuel oil only) to Panama. The distance is 10,233 miles, but the greatest distance on any one leg is 2,275 miles from Honolulu to San Diego.

Route 571. Thursday island to South American ports

To Callao passage can be made either (a), via Wellington (Route 568 (b)), or (2), via Tahiti (Route 567); there is little difference (54 miles only) in distance. To Valparaiso, Estrecho de Magallanes, or Cabo de Hornos, proceed via Wellington (Route 568 (b)).

Distances from Thursday island:—

Via Wellington to Callao, 8,329 miles; to Valparaiso, 7,670 miles; to Estrecho de Magallanes (Cabo Pilar), 7,006 miles; to Cabo de Hornos, 7,232 miles; via Tahiti to Callao, 8,383 miles.

Route 572.—*Reserved as spare.*

Route 573.—*Reserved as spare.*

(vi) ROUTES FROM NEW ZEALAND

CAUTION. *Fog. Visibility.* Fog is rare, excepting at the south end of New Zealand, In the Bay of Islands, and in Hokianga, there is sometimes a morning fog in September, October and November, which generally clears at 10h. a.m. Dense fog occurs occasionally in winter. In the Bay of Plenty fog has continued for three days in October, but this duration is very unusual. At the southern part of South island and in Foveaux strait, in autumn and winter, with a high barometer and light easterly winds, fog is not uncommon. *See* New Zealand Pilot for further details.

See Section D. Part III. Index on pages 357 and 358

Route 574. Auckland to Australian ports

In each case take the reverse of the route to Auckland as shown below.

(1) To BRISBANE.—Route 547. *Distance*, 1,360 miles. Page 138.

(2) To HOBART.—Route 488. *Distance*, 1,517 miles. Page 129.

(3) To MELBOURNE.—Route 492. *Distance*, 1,644 miles. Page 129.

(4) To SYDNEY.—Route 501. *Distance*, 1,274 miles. page 130.

(5) To THURSDAY ISLAND.—Route 568. *Distance*, 2,481 miles. Page 140.

Route 575. Auckland to Nouméa (New Caledonia), Suva (Fiji islands), Tongatapu (Friendly islands), Apia (Samoa islands), Rarotonga (Cook islands), and Tahiti (Îles de la Société)

Proceed as directly as navigation permits in all cases; to Rarotonga and Tahiti by Great Circle; to the remainder by Rhumb line.

Distance from Auckland to Nouméa, 988 miles; to Suva, 1,140 miles; to Tongatapu, 1,098 miles; to Apia, 1,583 miles ; to Rarotonga, 1,629 miles; to Tahiti, 2,215 miles.

CAUTION. Dangers, or possible dangers, have been reported in recent years in the area to the southward and south-eastward of the Friendly islands. Care must be exercised in navigating in the vicinity.

Route 576. Auckland to Fanning island or to Honolulu

(1) To FANNING ISLAND.—The Great Circle track may be taken; it passes clear of all *charted* dangers, though only about 5 miles westward of the obstruction reported in lat. 21° 57′ S., long. 174° 01′ W. The track passes close east of Manua islands.

(2) To HONOLULU.—Steer to pass a safe distance to the westward of Samoa islands and thence, after passing eastward of the Tokelau group, direct to Honolulu.

See Caution under Route 575.

Distance from Auckland to Fanning island, 2,843 miles; to Honolulu, 3,820 miles.

Note.—Vessels with limited radius of action may make the passage to Honolulu via Suva and/or Apia. The distance to Honolulu via Suva is 3,925 miles, and via Apia (direct), 3,843 miles. *See* Route 553 for further details of Suva *and* Apia route.

Route 577. Auckland to North American ports

Proceed via Apia and Honolulu. *(See* Route 576 (2) above). From Honolulu proceed as detailed in Routes 591 and 592 from Wellington.

Distance from Auckland to Prince Rupert, 6,238 miles; to Vancouver, 6,263 miles; to San Francisco, 5,933 miles; to San Diego, 6,118 miles.

Note.—An unbroken route may be taken by vessels with considerable bunker capacity, by using Route 576 (1) as far as Fanning island to join Route 613 to destination. *Distances* will be: 6,220 miles to Prince Rupert; 6,193 miles to Vancouver; 5,724 miles to San Francisco, and 5,783 miles to San Diego.

Route 578. Auckland to Manzanillo and to Panama

Proceed to Panama either direct, via Tahiti, or via Manzanillo.

(a) Direct.—Take a Great Circle track to lat. 41° 40′ S., long. 160° 00′ W. to join Route 593 (2) (a), Wellington to Panama.

(b) Via Tahiti.—Take Route 575 to Tahiti and from thence as in Route 593 (2) (b), Wellington to Panama.

(c) Via Manzanillo.—For vessels with a very small radius of action the passage may be made via Apia and Honolulu *(see* Route 576); thence to San Diego, and along the coast to Panama via Manzanillo.

Distance from Auckland to Panama, via (a), 6,695 miles; via (b), 6,785 miles; via (c), Apia, 1,583 miles; Honolulu, 2,262 miles; San Diego, 2,275 miles; Manzanillo, 1,128 miles; Panama, 1,719 miles. *Total* via (c), 8,965 miles.

Note.—If the passage is made direct from Honolulu to Manzanillo, there is a saving of 387 miles, but the distance from Honolulu to Manzanillo is 3,016 miles.

Note.—Fuel or diesel oil, but no coal, is available at Manzanillo. Coal is available at San Diego only by arrangement, but ample supplies are kept in stock at Los Angeles, 90 miles to the northward.

Route 579. Auckland to Callao

Take a Great Circle track direct.

Distance from Auckland to Callao, 5,828 miles.

Route 580. Auckland to Iquique, Valparaiso, Estrecho de Magallanes, and Cabo de Hornos

Take a Great Circle track to lat. 50° 00′ S., long. 140° 00′ W., a point on Route 485, Southern route across the South Pacific ocean. From this point proceed as follows:—

(1) To IQUIQUE OR VALPARAISO.—Take a Great Circle track direct.

(2) To ESTRECHO DE MAGALLANES.—Proceed by Rhumb line direct to Cabo Pilar.

(3) To CABO DE HORNOS.—Follow Route 485 to a point in lat. 52° 45′ S., long. 100° 00′ W., and thence a Rhumb line track to lat. 56° 40′ S., long. 67° 00′ W. and thence to pass Cabo de Hornos.

Distance from Auckland to Iquique, 5,828 miles; to Valparaiso, 5,237 miles; to Cabo Pilar (Estrecho de Magallanes), 4,573 miles; to Cabo de Hornos, 4,799 miles.

Route 581.—*Reserved as spare.*

Route 582. Wellington to Australian ports

In each case take the reverse of the route to Wellington shown below.

(1) To BRISBANE.—Route 548. *Distance*, 1,446 miles. Page 138.

(2) To HOBART.—Route 487. *Distance*, 1,290 miles. Page 129.

(3) To MELBOURNE.—Route 493. *Distance*, 1,489 miles. Page 129.

(4) To SYDNEY.—Route 500. *Distance*, 1,233 miles. Page 130.

(5) To THURSDAY ISLAND.—Route 568. *Distance*, 2,612 miles. Page 140.

Route 583. Wellington to Singapore, Borneo and Manila

In each case take the reverse of Route 568 to Thursday island, and thence:—

(1) To SINGAPORE.—Take Route 443. *See* page 109.

(2) To BALIK PAPAN OR TARAKAN.—Take Route 559. *See* page 139.

(3) To MANILA.—Take Route 560. *See* page 139.

Distances are the sum of the routes indicated above.

Route 584. Wellington to Yap and Hong Kong

Passage may be made via Thursday island or via Yap, the former being about 50 miles shorter.

(a) Via Thursday island.—Take the reverse of Route 568 to Thursday island, and thence Route 561 to Hong Kong.

(b) Via Yap.—Pass through Cook strait, and steer for a position lat. 20° 00′ S., long. 156° 30′ E., midway between the Bellona reefs and Kenn reef to join Route 512 (b) (ii), Sydney to Hong Kong via Guam. On reaching the Equator in about long. 153° 30′ S., steer towards Yap, and thence proceed as in Route 512 (b) (i) to Hong Kong.

Distance from Wellington to Hong Kong by (a), 5,309 miles; by (b), 5,390 miles; to Yap, 3,792 miles.

Route 585. Wellington to Guam and Shanghai

Proceed via Yap, Guam or Thursday island, the first named being 37 miles shorter than via Guam, and 336 miles shorter than via Thursday island; a more sheltered passage however may be expected on the last named route.

(a) Via Yap.—Take Route 584 (b) as far as Yap to join Route 513 (b) (i), Sydney to Shanghai, via Yap.

(b) Via Guam.—Proceed as in Route 584 (b), to lat. 20° 00′ S., long. 156° 30′ E. to join Route 512 (b) (ii), as far as Guam, where Route 513 (b) (ii) is taken to Shanghai.

(c) Via Thursday island.—Take Route 568 (b) in reverse to Thursday island, and there join Route 513 (a) (i), or (ii), according to season.

Distance from Wellington to Shanghai, via (a), 5,417 miles; via (b), 5,454 miles; via (c), 5,753 miles; to Guam, 3,770 miles.

Route 586. Wellington to Yokohama

Proceed as in Route 584 (b) (and 512 (b) (ii)) as far as Bougainville strait, whence the passage is continued to Yokohama as detailed in Route 514 (a), Sydney to Yokohama.

Distance from Wellington to Yokohama, 5,075 miles.

Note.—A call at Guam only lengthens the passage by about 50 miles.

Route 587. Wellington to Nouméa (New Caledonia) or Suva (Fiji islands)

In each case pass through Cook strait and thence proceed as directly as navigation permits westward of North island, New Zealand.

Distance from Wellington to Nouméa, 1,241 miles; to Suva, 1,476 miles.

Route 588. Wellington to Tongatapu (Friendly islands), or Apia (Samoan islands)

Proceed as directly as navigation permits, passing eastward of North island, New Zealand.

Distance from Wellington to Tongatapu, 1,394 miles; to Apia, 1,881 miles.

Route 589. Wellington to Honolulu or Fanning island

Take a Rhumb line track in each case as directly as navigation permits.

Distance from Wellington to Honolulu, 4,114 miles; to Fanning island, 3,109 miles.

Note.—A call at Apia, when bound for Honolulu, adds only about 25 miles to the total distance, and is recommended for coal-burning vessels with a small radius of action.

A call at Suva (*See* Routes 587 and 643 (3)), where all varieties of fuel are obtainable, adds only 145 miles to the distance by the direct route.

CAUTION. There are no fuel supplies available at Fanning island, and small stocks of coal only at Apia.

Route 590. Wellington to Rarotonga or Tahiti

After rounding Cape Palliser, take a Great Circle track to either destination.

Distance from Wellington to Rarotonga, 1,800 miles; to Tahiti, 2,348 miles.

Route 591. Wellington to Prince Rupert or Vancouver

Passage may be made either direct, via Honolulu, or via Apia and Honolulu.

(a) Direct.—After clearing the coast of New Zealand, take a Rhumb line track as directly as navigation permits, to cross the Equator at about long. 157° 00′ W. Thence take a Great Circle to destination via Juan de Fuca, or Hecate strait to Vancouver or Prince Rupert respectively.

CAUTION. The track passes between Buffon reef and Harans reef, the position of each of which is doubtful; it then passes west of Beveridge reef and east of Antiope reef. As no soundings have been recorded in this area and along much of the rest of the track great care must be exercised.

(b) Via Honolulu.—Proceed as directly as navigation permits to Honolulu and thence on a Great Circle to Juan de Fuca, or Hecate strait, according to destination.

(c) Via Apia and Honolulu.—Vessels with a limited radius of action can call at Apia, where a small stock of coal is kept; no fuel oil is normally stored. The distance is increased by only about 25 miles. *See also* Notes under Route 589.

Distance from Wellington to Prince Rupert by (a), 6,480 miles; by (b), 6,510 miles. To Vancouver by (a), 6,448 miles; by (b), 6,533 miles.

By (c), the distances are:

To Apia, 1,881 miles; to Honolulu, 2,260 miles; to Prince Rupert, 2,395 miles. *Total distance* to Prince Rupert, 6,536 miles.

To Apia, 1,881 miles; to Honolulu, 2,260 miles; to Vancouver, 2,420 miles. *Total distance* to Vancouver, 6,561 miles.

Note.—The passage may be made also via Fanning island, but as no fuel stocks are maintained at that island, no advantage is gained by a call there. The distance is only 11 miles more to Vancouver, and 6 miles more to Prince Rupert.

CAUTION.—*See* Route 741 regarding Currents, Fogs, Kelp, etc.

Route 592. Wellington to San Francisco or San Diego

Passage may be made direct, via Honolulu, via Apia, or via Apia and Honolulu.

(a) Direct.—Take a Great Circle track direct to either destination.

Notes.—Much of the route to either port has not been surveyed and undiscovered dangers may exist.

The track to San Francisco passes within about 40 miles eastward of Starbuck island and of Malden island (*between Lats. 5° and 6° S., Long. 155° W.*). The currents in the vicinity, which run usually to the westward (South Equatorial current) are uncertain in velocity, and are reported occasionally to be reversed; great caution is therefore necessary until past these low and dangerous reef-islets. A large portion of the reefs of both islands is awash, and is prolonged in an easterly direction. *See* Pacific Islands Pilot, Vol. III.

To San Diego, the track passes between Hervey island and Aitutaki in the Cook islands and, later, very close to Vostok island (*Lat. 10° 00′ S., Long. 152° 15′ W.*). Thence it clears all known dangers, but much of the route is unsurveyed (Breakers were reported in 1944 about 60 miles west of the track in lat. 6° 15′ S., long. 150° 45′ W).

(b) Via Honolulu.—Take Route 589 to Honolulu, and thence a Great Circle track to destination.

(c) Via Apia.—Take Route 588 to Apia and thence take a Great Circle track direct to either destination. They are both clear of all *charted* dangers.

(d) Via Apia and Honolulu.—Take Route 589 (calling at Apia) to Honolulu, and thence as in (b) above. This route is recommended for vessels with a small radius of action, but *see* Notes under Route 589.

Distances from Wellington are:—

By (a), to San Francisco, 5,906 miles; to San Diego, 5,852 miles.

By (b), to Honolulu, 4,114 miles; to San Francisco, 2,090 miles: *Total distance,* 6,204 miles. Honolulu to San Diego, 2,275 miles: *Total distance,* 6,389 miles.

By (c), to Apia, 1,881 miles; to San Francisco, 4,165 miles: *Total distance,* 6,046 miles. Apia to San Diego, 4,196 miles: *Total distance,* 6,077 miles.

By (d): The *total distances* are about 25 miles longer than (b) above; the distance from Apia to Honolulu is 2,260 miles. *See* Notes under Route 589.

See Remarks on Fogs under Routes 740 and 741.

Route 593. Wellington to Manzanillo or Panama

(1) To Manzanillo.—Take Route 590 to Tahiti. Thence take Rhumb line tracks first to lat. 14° 43′ S., long. 148° 53′ W., north-west of Matahiva, Archipel des Tuamotu, and then to lat. 6° 30′ S., long. 140° 00′ W., north-west of Îles Marquises. From this point take a Great Circle track direct to destination.

Note.—The direct Great Circle from Cape Palliser passes through the Archipel des Tuamotu, and the distance saved is only 60 miles.

(2) To Panama.—An unbroken route may be taken or one via a Pacific island fuelling port, according to radius of action, as follows:—

(a) Unbroken route.—Take the Great Circle track to a position lat. 41° 40′ S., long. 160° 00′ W. From this point take a second Great Circle track to a position on the Equator, in long. 83° 00′ W. crossing the various meridians at the following latitudes:—

Long.	150° W.	at lat.	40° 00′ S.
,,	140° W.	,, ,,	37° 20′ S.
,,	130° W.	,, ,,	33° 35′ S.
,,	120° W.	,, ,,	29° 00′ S.
,,	110° W.	,, ,,	22° 30′ S.
,,	100° W.	,, ,,	15° 00′ S.
,,	90° W.	,, ,,	6° 25′ S.

From the position on the Equator, steer as directly as navigation permits, eastward of Isla Malpelo to Balboa (Panama).

Note.—The direct Great Circle track between Wellington and Panama crosses the meridian of 150° 00′ W., at lat. 38° 30′ S. The area immediately northward of this position has in it several reported dangers (Maria Theresa reef, Ernest Legouvé reef, etc.; *see* Pacific Islands Pilot, Vol. III).

The route given above is therefore recommended, and it is only 45 miles longer than the direct Great Circle track between the two places.

(b) Via Tahiti.—Take the Great Circle track to Tahiti, and then, after passing westward and northward of Archipel des Tuamotus continue on another Great Circle to a position lat. 6° 21′ N., long. 80° 35′ W. at the entrance of Panama bay, and thence proceed as directly as navigation permits to Balboa.

(c) Via Tahiti and Manzanillo.—Take Route (1) above to Manzanillo and thence proceed along the coast to Panama.

Note.—Fuel and diesel oil, but no coal, is available at Manzanillo. Vessels with a limited coal capacity must use (d) or (e) below.

(d) Via Tahiti and San Diego.—Take Route 590 to Tahiti, and thence, passing west of Archipel des Tuamotu, take a Great Circle track direct to San Diego.

(e) Via Apia, Honolulu, San Diego and Manzanillo.—Take Route 592 (d) to San Diego and proceed thence along the coast to Manzanillo and Panama. This route is designed for vessels with a small radius of action. *See* Notes under Route 589.

Note.—Coal is available at San Diego only by arrangement, but supplies are ample at Los Angeles, 90 miles to the northward.

Distances from Wellington are:—

To Manzanillo, via Tahiti, 5,843 miles.

To Panama: By (2) (a), 6,533 miles. By (2) (b), to Tahiti, 2,348 miles; to Panama, 4,570 miles. *Total distance*, 6,918 miles.

By (2) (c), to Tahiti, 2,348 miles; to Manzanillo, 3,495 miles; to Panama, 1,719 miles. *Total distance*, 7,562 miles.

By (2) (d): To Tahiti, 2,348 miles; to San Diego, 3,550 miles; to Panama, 2,839 miles. *Total distance*, 8,737 miles.

By (2) (e): To Apia, 1,881 miles; to Honolulu, 2,260 miles; to San Diego, 2,275 miles; to Manzanillo, 1,128 miles; to Panama, 1,719 miles. *Total distance*, 9,263 miles. *See also* Notes under Route 589.

Route 594. Wellington to Callao

Steer first to pass north of Chatham islands, and then take a Great Circle track direct to Callao.

Distance from Wellington to Callao, 5,717 miles.

Route 595. Wellington or Port Chalmers to Iquique, Valparaiso, Estrecho de Magallanes and Cabo de Hornos

From Wellington, take a Great Circle track to lat. 49° 30′ S., long. 150° 00′ W.; from Port Chalmers, or other ports on east coast of New Zealand, take a Great Circle track to a position lat. 48° 30′ S., long. 165° 00′ W. In either case continue on a Rhumb line to a position lat. 50° 00′ S., long. 140° 00′ W., and thence:—

(1) To Iquique or Valparaiso.—Take a Great Circle track direct to either destination.

(2) To Estrecho de Magallanes.—Continue on a Rhumb line direct to Cabo Pilar.

(3) To Cabo de Hornos.—Steer first on a Rhumb line to a position lat. 52° 40′ S., long. 100° 00′ W. and thence on a second Rhumb line to a position in lat. 56° 52′ S., long. 68° 42′ W., about 20 miles southward of Diego Ramirez islands; and then turn to the north-eastward to pass Cabo de Hornos at a distance of about 15 miles.

Distance from Wellington: To Iquique, 5,649 miles; to Valparaiso, 5,058 miles; to Cabo Pilar (Estrecho de Magallanes), 4,394 miles; to Cabo de Hornos, 4,620 miles.

Distance from Port Chalmers: To Iquique, 5,694 miles; to Valparaiso, 5,104 miles; to Cabo Pilar (Estrecho de Magallanes), 4,439 miles; to Cabo de Hornos, 4,665 miles.

CAUTION. *Ice. See* page 126.

Route 596. Wellington to Bishop rock (English channel)

Four routes may be taken, two eastward, via Panama, or via Estrecho de Magallanes, and two westward, via Aden, or via Cape Town.

(a) Via Panama.—Take Route 593 to Panama, and thence as in Route 526 (a).

(b) Via Estrecho de Magallanes.—Take Route 595 to Cabo Pilar, and thence as in Route 526 (b).

(c) Via Aden.—Take the reverse of Route 492 as far as Wilson promontory and there join Route 497 (3), Sydney to Fremantle, and thence as in Route 526 (c).

(d) Via Cape Town.—Take the reverse of Route 492 as far as Wilson promontory and there join Route 526 (d).

Distances from Wellington to Bishop rock:—

Via Panama, 10,924 miles; via Estrecho de Magallanes, 11,613 miles; via Aden, 12,102 miles; via Cape Town, 12,847 miles.

Route 597. Bluff harbour to Australian ports

In each case take the reverse of the route to Bluff harbour shewn below.

(1) To Brisbane.—Route 549. *Distance*, 1,465 miles. Page 138.

(2) To Hobart.—Route 486. *Distance*, 930 miles. Page 129.

(3) To Melbourne.—Route 494. *Distance*, 1,208 miles. Page 129.

(4) To Sydney.—Route 499. *Distance*, 1,105 miles. Page 130.

Route 598. The Snares to Iquique, Valparaiso, Estrecho de Magallanes and Cabo de Hornos

Take the Great Circle track to lat. 48° 30′ S., long. 165° 00′ W., and join Route 595. The distance is about 120 miles longer than those given from Wellington.

Note.—The routes from The Snares are taken from a position about 50 miles east-north-east of the islands in lat. 47° 50′ S., long. 167° 50′ E.

Routes to The Snares from the Indian ocean are given in Section B, Part III.

Route 599 and 600.—*Reserved as spare.*

(vii) ROUTES FROM THE PACIFIC ISLANDS

A. FROM HONOLULU.

Route 601. Honolulu to North American ports

To Prince Rupert, or to Vancouver, take a Great Circle track to Dixon entrance, or to Juan de Fuca strait respectively, and thence proceed as directly as navigation will allow to destination.

To other North American ports take a Great Circle track direct.

Distances from Honolulu:—

To Dutch harbour, 2,037 miles; to Columbia R. (Astoria), 2,246 miles; to Prince Rupert, 2,396 miles; to San Diego, 2,275 miles; to San Francisco, 2,091 miles; to Vancouver, 2,419 miles.

Route 602. Honolulu to Mexican and Central American ports

In each case take a Great Circle track direct.

Distance from Honolulu to Acapulco, 3,287 miles; to Manzanillo, 3,016 miles; Mazatlan, 2,853 miles; Panama, 4,683 miles; Salina Cruz, 3,552 miles.

Note.—Vessels with a small radius of action may proceed to Panama via San Diego (Route 601), via Manzanillo or via San Diego and Manzanillo.

The distances to Panama will be:—

Via San Diego: Honolulu to San Diego, 2,275 miles; San Diego to Panama, 2,839 miles. *Total distance*, 5,114 miles.

Via Manzanillo: Honolulu to Manzanillo, 3,016 miles; Manzanillo to Panama, 1,719 miles. *Total distance*, 4,735 miles.

Via San Diego and Manzanillo: Honolulu to San Diego, 2,275 miles; San Diego to Manzanillo, 1,128 miles; Manzanillo to Panama, 1,719 miles. *Total distance*, 5,122 miles.

CAUTION. No coal is available at San Diego or Manzanillo, but supplies can be obtained at Los Angeles about 90 miles to the northward of the former. Fuel and diesel oil is available at both places.

Route 603. Honolulu to South American ports, to Estrecho de Magallanes, and to Cabo de Hornos

Take a Great Circle track direct in each case.

To Cabo de Hornos the Great Circle track passes about 60 miles eastward of Îles Marquises, and about the same distance eastward of Henderson island (*Lat. 24° 22′ S., Long. 128° 18′ W.*).

Distance from Honolulu to Callao, 5,157 miles; to Iquique, 5,716 miles; to Valparaiso, 5,912 miles; to Estrecho de Magallanes (Cabo Pilar), 6,170 miles; to Cabo de Hornos, 6,473 miles.

Route 604. Honolulu to Tahiti, Fanning island, Rarotonga, Apia, Tongatapu, or Suva

(1) To TAHITI, FANNING ISLAND, RAROTONGA, APIA, OR TONGATAPU.—Take as direct a course as navigation will permit. *See* Route 621.

(2) To SUVA.—Follow the relevant part of Route 504 (1) (a) in reverse.

Distance from Honolulu to Apia, 2,262 miles; to Fanning island, 1,054 miles; to Rarotonga, 2,553 miles; to Suva, 2,783 miles; to Tahiti, 2,379 miles; Tongatapu, 2,751 miles.

Route 605. Honolulu to Auckland or Wellington

Take the reverse of Route 576 (2) to Auckland, or of Route 589 to Wellington.

Vessels with a small radius of action may call at Apia to re-fuel if necessary. Only about 25 miles is added to the total distance. *See* Notes under Route 589.

Distance from Honolulu to Auckland, 3,820 miles; to Wellington, 4,114 miles.

Route 606. Honolulu to Thursday island, Brisbane or Sydney

Take the reverse of the routes indicated below.

(1) To THURSDAY ISLAND.—Reverse of Route 565 (a) or (b). *Distance*, 4,295 or 4,178 miles. Page 140.

(2) To BRISBANE.—Reverse of Route 540. *Distance*, 4,139 miles. Page 137.

(3) To SYDNEY.—Reverse of Route 504 (1) (a), or 504 (1) (b). *Distance*, 4,518 or 4,543 miles. Page 131.

For routes onward from Thursday island into the Indian ocean. *See* Part III, Chapter V.

Route 607. Honolulu to Yokohama

(a) Usual route.—Take a Rhumb line track which passes about 20 miles southward of the chain of islets and reefs, and proceeds direct to the entrance to Yokohama bay.

Good weather is usually experienced on this route.

(b) Alternative route.—Pass along the north side of the chain of islands until abreast Midway island, and thence take a Great Circle track to Yokohama.

Distance from Honolulu to Yokohama, by (a), 3,430 miles; by (b), 3,389 miles.

Route 608. Honolulu to Shanghai or to Hong Kong

(1) To SHANGHAI.—Take the reverse of Route 727 (1).

(2) To HONG KONG.—Take Route 607 (a) towards Yokohama as far as the meridian of 180°, lat. 26° 00′ N., and from this point take the Great Circle track for a position lat. 21° 25′ N., long. 121° 00′ E. in the Bashi channel, southward of Formosa. The vertex of this Great Circle is at long. 162° 00′ E. in lat. 27° 05′ N., and passes between Kazan rettō and Ogasawara guntō, between lats. 26° 15′ N. and 25° 30′ N. It also passes about 30 miles southward of Okino-Ōagari shima (109 feet high).

From Bashi channel, the course is the direct Rhumb line to Hong Kong.

Distance from Honolulu to Hong Kong, 4,849 miles; to Shanghai, 4,322 miles.

Route 609. Honolulu to Guam

Take the Great Circle track to Guam. This passes closely to Wake island, lat. 19° 11′ N., long. 166° 31′ E., which is only about 20 feet high, and consequently should be given a wide berth. (*See* Pacific Islands Pilot, Vol. II.)

Distance from Honolulu to Guam, 3,330 miles.

Route 610. Honolulu to Singapore

For routes onward from Singapore into the Indian ocean. *See* Part III., Chapter V.

(a) Via Bashi channel.—Take Route 608 (2) as far as the Bashi channel and thence proceed to pick up the Main Route of the China sea between Macclesfield bank and the Paracel islands (*see* Route 687 (1)).

(b) Via Guam.—Take Route 609 to Guam and thence Route 668 (2) to Singapore.

Distance from Honolulu to Singapore, by (a), 6,049 miles; by (b), 5,997 miles.

Route 611. Honolulu to Manila

(a) Direct.—Follow a Great Circle track direct to San Bernardino strait, and thence continue as directly as navigation permits to Manila.

(b) Via Guam.—Take Route 609 to Guam, and thence a Great Circle track to San Bernardino strait, and thence proceed as directly as navigation permits to Manila.

Distance from Honolulu to Manila by (a), 4,762 miles; by (b), 4,827 miles.

Route 612.—*Reserved as spare.*

B. FROM FANNING ISLAND.

CAUTION. No fuel is available at Fanning island. Ample supplies of fuel of all kinds are available at Honolulu (1,054 miles) northward of Fanning island.

To the southward, Suva (1,884 miles) is the nearest island where coal and fuel oil can be obtained in large quantities. At Tahiti (1,411 miles) a moderate supply of coal and diesel oil is kept in stock and a small quantity of fuel oil might be obtained.

A small stock of coal is kept at Apia (1,293 miles).

Route 613. Fanning island to Honolulu and North American and Mexican ports

(1) To Honolulu.—Proceed as directly as navigation permits.

(2) To Prince Rupert, Vancouver, San Francisco or San Diego.—In each case take a Great Circle track direct. The passage may be made via Honolulu if re-fuelling is necessary. *See* (1) above and Route 601.

(3) To Meixcan ports.—Take a Great Circle track direct.

Distances from Fanning island:—

To Acapulco, 3,593 miles; to Honolulu, 1,054 miles; to Manzanillo, 3,447 miles; to Mazatlan, 3,286 miles; to Prince Rupert, 3,377 miles; to San Diego, 2,939 miles; to San Francisco, 2,881 miles; to Vancouver, 3,350 miles.

Route 614. Fanning island to Panama

Take a Great Circle track direct.

Distance from Fanning island to Panama, 4,850 miles.

Route 615. Fanning island to Tahiti, Rarotonga, Apia, Tongatapu or Suva

(1) To Tahiti, Rarotonga, Apia or Tongatapu.—Take a course as directly as navigation permits.

(2) To Suva.—Take the reverse of the appropriate part of Route 504 (2) (b).

Distance from Fanning island to Apia, 1,293 miles; to Rarotonga, 1,504 miles; to Suva, 1,885 miles; to Tahiti, 1,411 miles; to Tongatapu, 1,770 miles.

Route 616. Fanning island to Auckland and Wellington

In each case take the route indicated below.

(1) To Auckland.—Reverse of Route 576 (1). *Distance*, 2,843 miles. Page 141.

(2) To Wellington.—Reverse of Route 589. *Distance*, 3,109 miles. Page 142.

Route 617. Fanning island to Australian ports

In all cases take the route indicated below.

(1) To Brisbane.—Reverse of Route 545. *Distance*, 3,405 miles. Page 138.

(2) To Sydney.—Reverse of Route 504 (2) (a) or (b). *Distances*, 3,600 and 3,619 miles respectively. Page 131.

(3) To Thursday island.—Reverse of Route 565 (a). *Distance*, 3,840 miles. Page 140.

For routes onward from Thursday island into the Indian ocean, *see* Part III, Chapter V.

Route 618. Fanning island to Hong Kong

Take a Great Circle track to a position in lat. 21° 25′ N., long. 145° 00′ E., passing north of the Marianas islands; thence proceed by Great Circle, or Rhumb line (there is no practical difference in distance), to a position in lat. 21° 25′ N. long. 121° 00′ E., in the Bashi channel. From Bashi channel, the course is the direct Rhumb line to destination.

Distance from Fanning island to Hong Kong, 5,121 miles.

C. FROM TAHITI.

Route 619. Tahiti to ports in America from Callao northwards

In each case the route is northward of Archipel des Tuamotu.

(1) To Prince Rupert, Vancouver, San Francisco or San Diego.—After clearing Matahiva, Archipel des Tuamotu, take a Great Circle track direct to destination.

(2) To Manzanillo.—Proceed as in Route 593 (1).

(3) To Panama.—Proceed as in Route 593 (2) (b).

(4) To Callao.—Steer northward to clear Matahiva and thence to the eastward to pass northward of Disappointment islands. Thence take a Great Circle track direct to Callao. By passing southward of Ahunui (*Lat. 19° 40′ S., Long. 140° 28′ W.*) and then taking a Great Circle track to Callao the distance is reduced by about 135 miles.

Distance from Tahiti to Prince Rupert, 4,438 miles; to Vancouver, 4,312 miles; to San Francisco, 3,666 miles; to San Diego, 3,550 miles; to Manzanillo, 3,495 miles; to Panama, 4,570 miles; to Callao, 4,350 miles.

Note.—Vessels with a small radius of action should proceed via Honolulu *(See* Route 621); thence, when bound to ports south of San Diego, proceed via that port and Manzanillo. The total distance is very much increased, but the longest uninterrupted passage is only 2,380 miles between Tahiti and Honolulu.

Route 620. Tahiti to Iquique, Valparaiso, Estrecho de Magallanes or Cabo de Hornos

(1) To Iquique.—Take the Great Circle track direct passing southward of Ahunui (*Lat. 19° 40′ S., Long. 140° 28′ W.*).

(2) To Valparaiso.—Steer to pass a safe distance south of Hereheretue and the Duke of Gloucester group, and thence take a Great Circle track direct to Valparaiso. The track passes close south of Islas Juan Fernandez and Mas Afuera.

(3) To Estrecho de Magallanes or Cabo de Hornos.—Take a Great Circle track to Cabo Pilar, if bound to Estrecho de Magallanes or, if bound to Cabo de Hornos, take a Great Circle track to a point south of Islas Diego Ramirez and thence to Cabo de Hornos.

Distance from Tahiti to Iquique, 4,484 miles; to Valparaiso, 4,256 miles; to Cabo Pilar, 4,031 miles; to Cabo de Hornos, 4,289 miles.

Route 621. Tahiti to Honolulu

Take a Rhumb line track direct. The track passes between Caroline and Vostok islands and close to the breakers, reported in 1926 as lying about 30 miles south-westward of Filippo reef.

Distance from Tahiti to Honolulu, 2,380 miles.

Route 622. Tahiti to Rarotonga, Tongatapu, Apia or Suva

(1) To Rarotonga.—Proceed by Rhumb line direct.

(2) To Tongatapu.—Steer to pass northward of the Cook islands, and thence to pass midway between the charted positions of Buffon and Harans reefs; thence proceed direct to destination.

(3) To Apia.—Proceed as directly as navigation permits.

(4) To Suva.—Proceed as directly as navigation permits, passing through Nanuku passage, or through Lakemba passage, the distance by the latter being about 30 miles less. *See* Pacific Islands Pilot, Vol. II.

Distance from Tahiti to Rarotonga, 619 miles; to Tongatapu, 1,470 miles; to Apia, 1,305 miles; to Suva (via Lakemba passage), 1,835 miles.

Route 623. Tahiti to Auckland or Wellington

Take a Great Circle track direct to either destination.

Distance from Tahiti to Auckland, 2,215 miles; to Wellington, 2,350 miles.

Route 624. Tahiti to Thursday Island, Brisbane or Sydney

In each case take the route indicated below.

(1) To THURSDAY ISLAND.—Reverse of Route 567. *Distance*, 4,033 miles. Page 140.

(2) To BRISBANE.—Reverse of Route 546. *Distance*, 3,255 miles. Page 138.

(3) To SYDNEY.—Reverse of Route 502. *Distance*, 3,304 miles. Page 130.

For routes onward from Thursday island into the Indian ocean. *See* Part III, Chapter V.

Route 625.—*Reserved as spare.*

Route 626. Tahiti to Yokohama

Take the Great Circle direct. *See* Route 743 (2). *Distance* from Tahiti to Yokohama, 5,139 miles.

Route 627. Tahiti to Guam and Shanghai

Steer first to pass Apia or to call at that port; thence proceed as directly as navigation will permit to join Route 513 (b) (ii) at Guam, crossing the Equator in about long. 154° 00′ E, and proceeding to Guam as given in Route 512 (b) (ii).

Distance from Tahiti to Shanghai, 6,172 miles.

Note.—The direct route, not calling at Guam, is about 165 miles shorter, but it is not recommended.

Route 628. Tahiti to Yap, Hong Kong or Manila

Proceed via Yap, crossing the Equator at about long. 154° 00′ E. after passing near or calling at Apia as given in Route 627.

From Yap proceed via Balintang channel *(see* Route 512 (b) (i)) to Hong Kong. To Manila pass through San Bernardino strait.

Distance from Tahiti to Hong Kong (calling at Apia (1,303 miles) and Yap (3,296 miles from Apia), 6,197 miles; to Manila (calling as above), 5,755 miles.

Route 629. Tahiti to Singapore

Take the reverse of Route 567 to Thursday island, and then proceed by Route 443 (a) or (b) to Singapore.

Distance from Tahiti to Singapore, via 443 (a), 6,579 miles; via 443 (b), 6,537 miles.

For routes onward into the Indian ocean from Singapore. *See* Part III, Chapter V.

Route 630.—*Reserved as spare.*

D. FROM APIA.

Route 631. Apia to Fanning island or Honolulu

Take as direct a course as navigation will permit.

Distance from Apia to Fanning island, 1,295 miles; to Honolulu, 2,260 miles.

Route 632. Apia to North American ports

(1) To PRINCE RUPERT or VANCOUVER.—Take Route 631 above to Honolulu and thence Route 601 to destination.

(2) To SAN FRANCISCO or SAN DIEGO.—Proceed either on a Great Circle direct or via Honolulu (Route 631 and 601).

Distance from Apia to Prince Rupert. 4,655 miles; to Vancouver, 4,680 miles; to San Francisco (direct), 4,165 miles; (via Honolulu), 4,351 miles; to San Diego (direct), 4,196 miles; (via Honolulu), 4,535 miles.

Route 633. Apia to Rarotonga or Tahiti

Proceed as directly as navigation permits.

Distance from Apia to Rarotonga, 820 miles; to Tahiti, 1,305 miles.

Route 634. Apia to Manzanillo

Passage may be made direct, via Tahiti, or via Honolulu.

(a) Direct route.—Steer first to a position in lat. 12° 09′ S., long. 170° 00′ W., and there join Route 646 (a), Suva to Manzanillo. *See* also Route 553.

(b) Via Tahiti.—Take Route 633 to Tahiti, and Route 593 (1) from Tahiti to Manzanillo.

(c) Via Honolulu.—Take Route 631 to Honolulu; and thence take a Great Circle track direct to Manzanillo.

Distance from Apia to Manzanillo by (a), 4,456 miles; by (b), 4,800 miles; by (c), 5,276 miles.

Note.—Vessels with a small radius of action should proceed via Honolulu and San Diego *(see* Route 632 (2)) and thence along the coast to Manzanillo.

Route 635. Apia to Panama

Proceed direct, via Tahiti, or (in the case of vessels with a small radius of action) via Honolulu, San Diego and Manzanillo.

(a) Direct route.—Take a Great Circle track to a position in lat. 10° 45′ S., long. 136° 35′ W. to join Route 647 (a), Suva to Panama (direct).

(b) Via Tahiti.—Take Route 633 to Tahiti, and thence the relevant part of Route 593 (2) (b) to Panama.

(c) Via Honolulu, San Diego and Manzanillo.—Take Route 634 (c) to Manzanillo *(see* Note), and thence along the coast to Panama.

Distance from Apia to Panama, by (a), 5,709 miles; by (b), 5,870 miles; by (c), 7,382 miles, the longest leg being 2,275 miles.

Route 636. Apia to South American ports

(1) To CALLAO.—Take a Great Circle track to a point south of Ahunui, Archipel des Tuamotu, and thence a second Great Circle track direct to Callao.

(2) To IQUIQUE.—Take a Great Circle track direct. The track passes close to Pitcairn island and Sala y Gomez islet.

(3) To VALPARAISO.—Take a Great Circle track direct. This passes close to Rarotonga.

Distance from Apia to Callao, 5,494 miles; to Iquique, 5,750 miles; to Valparaiso, 5,451 miles.

Route 637. Apia to Suva or Tongatapu

Proceed as directly as navigation permits, passing through Nanuku passage when bound for Suva, and east of the Friendly island when bound for Tongatapu

Distance from Apia to Suva, 644 miles; to Tongatapu, 512 miles.

Route 638. Apia to Auckland or Wellington

Proceed as directly as navigation permits. *See* Routes 575 and 588.

Distance from Apia to Auckland, 1,583 miles; to Wellington, 1,881 miles.

Route 639. Apia to Thursday island, Brisbane or Sydney

Take the route indicated below.

(1) To THURSDAY ISLAND.—Reverse of Route 566 (2). *Distance*, 2,771 miles. Page 140.

(2) To BRISBANE.—Reverse of Route 544 (a) or (b). *Distance*, 2,173 miles. Page 138.

(3) To SYDNEY.—Reverse of Route 503 (2). *Distance*, 2,357 miles. Page 131.

Route 640. Apia to Guam, Yap, Yokohama, Shanghai, Hong Kong or Manila

(1) To YOKOHAMA.—Take the reverse of Route 743 (3). *Distance*, to Yokohama, 4,122 miles. Page 161.

(2) To GUAM and SHANGHAI.—Take Route 627 (from Tahiti). *Distance*, to Shanghai, 4,869 miles; to Guam, 3,178 miles. Page 146.

(3) To YAP, HONG KONG or MANILA.—Take Route 628 (from Tahiti). *Distance* to Hong Kong, 4,894 miles; to Manila, 4,452 miles; to Yap, 3,296 miles. Page 146.

Route 641. Apia to Singapore

Take the reverse of Route 566 (2) to Thursday island, and thence proceed by Route 443 (a) or (b), to Singapore.

Distance from Apia to Singapore, via 443 (a), 5,317 miles; via 443 (b), 5,275 miles.

For routes onward from Singapore into the Indian ocean. *See* Part III, Chapter V.

Route 642.—*Reserved as spare.*

E. FROM SUVA.

Route 643. Suva to Apia, Fanning island or Honolulu

(1) To APIA.—Proceed as directly as navigation permits, passing through Nanuku passage.

(2) To FANNING ISLAND.—Take the relevant part of Route 504 (2) (b).

(3) To HONOLULU.—Take the relevant part of Route 504 (1) (a).

Distance, from Suva to Apia, 644 miles; to Fanning island, 1,884 miles; to Honolulu, 2,783 miles.

Note.—Coal-burning vessels of very small radius of action may proceed to Honolulu via Apia. The total distance is increased by 120 miles.

Route 644. Suva to North American ports

(1) To PRINCE RUPERT or VANCOUVER.—Proceed via Honolulu (Route 643 (3) above), and thence take Route 601 to destination.

(2) To SAN FRANCISCO or SAN DIEGO:—

(a) Direct.—After passing through Nanuku passage take a Great Circle track direct to either destination. The Great Circle to San Francisco passes through the Tokelau islands between Nukunono and Atafu and thence west of Fanning island; to San Diego the Great Circle passes east of the Tokelau islands and between Fanning and Christmas islands.

(b) Via Honolulu.—Take Route 643 (3) above to Honolulu, and thence proceed by Great Circle direct to destination.

Distance from Suva to Prince Rupert, 5,179 miles; to Vancouver, 5,202 miles; to San Francisco by 2 (a), 4,756 miles, by 2 (b), 4,874 miles; to San Diego by 2 (a), 4,811 miles; by 2 (b), 5,058 miles.

See Note in Route 643 above.

Route 645. Suva to Tongatapu, Rarotonga or Tahiti

Proceed as direct as navigation permits, leaving the Fiji islands by Nanuku passage or Lakemba passage when bound for Rarotonga or Tahiti. *See* Pacific Islands Pilot, Vol. II.

Distance from Suva to Tongatapu, 415 miles; to Rarotonga, 1,252 miles; to Tahiti, 1,835 miles.

Route 646. Suva to Manzanillo

Passage may be made either direct, via Tahiti or, for vessels with a small radius of action, via Honolulu and San Diego.

(a) Direct route.—After clearing Nanuku passage, steer first to a position in lat. 12° 09′ S., long. 170° 00′ W., a point on the Great Circle track from the north-west point of the Samoan islands to Manzanillo, and thence continue on the Great Circle to destination. *See* Note on currents near Starbuck and Malden islands under Route 592 (a).

(b) Via Tahiti.—Take Route 645 to Tahiti, and thence proceed as in Route 593 (1).

(c) For vessels with a small radius of action, via Honolulu and San Diego.—Take Route 644 (2) (b) to San Diego and thence proceed southward along the coast to Manzanillo. *See* Note under Route 643.

Distance from Suva to Manzanillo by (a), 5,068 miles; by (b), 5,330 miles; by (c), 6,186 miles.

Route 647. Suva to Panama

Passage may be made direct, via Tahiti, or via Honolulu, San Diego and Manzanillo.

(a) Direct route.—Having cleared Nanuku passage take a Great Circle track to a position in lat. 6° 30′ S., long. 120° 00′ W. to join Route 593 (2) (b).

(b) Via Tahiti.—Take Route 645 to Tahiti to join Route 593 (2) (b).

(c) Via Honolulu, San Diego and Manzanillo.—Vessels with a small radius of action may take Route 646 (c) to Manzanillo and thence proceed along the coast to Panama.

Distance from Suva to Panama by (a), 6,323 miles; by (b), 6,405 miles; by (c), 7,905 miles.

Route 648. Suva to Callao

After passing through Nanuku passage, take Rhumb line track first to a position in lat. 18° 48′ S., long. 159° 43′ W., north of Aitutaki and secondly to lat. 19° 46′ S., long. 140° 26′ W., south of Ahunui. Thence take a Great Circle track direct to Callao.

Distance from Suva to Callao, 6,040 miles.

Route 649. Suva to Iquique

Proceed as in Route 648 to the position north of Aitutaki; thence take a Rhumb line track to a position in lat. 24° 55′ S., long. 130° 10′ W., north of Pitcairn island. From this point take a Great Circle track direct to Iquique.

Distance from Suva to Iquique, 6,407 miles.

Route 650. Suva to Valparaiso

Pass through Nanuku passage and then take a Rhumb line track to lat. 17° 30′ S., long. 173° 00′ W. From this point take a Great Circle track direct to Valparaiso, passing midway between Beveridge and Buffon reefs.

Distance from Suva to Valparaiso, 5,900 miles.

Route 651. Suva to Estrecho de Magallanes or Cabo de Hornos

Take a Great Circle track towards a position in lat. 52° 40′ S., long. 100° 00′ W. but leave the Great Circle either at (1) lat. 50° 30′ S., long. 129° 10′ W., or at (2) lat. 51° 00′ S., long. 127° 00′ W.; thence continue as follows:—

(1) To ESTRECHO DE MAGALLANES.—Take a Rhumb line to a position in 52° 38′ S., 74° 42′ W., north of Cabo Pilar.

(2) To CABO DE HORNOS.—Proceed as in Route 595 (3).

Distance from Suva to Cabo Pilar, 5,154 miles; to Cabo de Hornos, 5,405 miles.

Route 652.—*Reserved as spare.*

Route 653. Suva to Auckland or Wellington

In each case proceed as directly as navigation permits, passing west of New Zealand and through Cook strait if bound to Wellington.

Distance from Suva to Auckland, 1,140 miles; to Wellington, 1,476 miles.

Routes 654. Suva to Thursday island, Brisbane or Sydney

In each case take the reverse of the route indicated below.

(1) To THURSDAY ISLAND.—Reverse of Route 566 (1). *Distance*, 2,206 miles. Page 140.

(2) To BRISBANE.—Reverse of Route 542. *Distance*, 1,560 miles. Page 137.

(3) To SYDNEY.—Reverse of Routes 503 (1). *Distance*, 1,735 miles. Page 130.

For routes onward from Thursday island into the Indian ocean. *See* Part III, Chapter V.

Route 655. Suva to Yokohama

Pass through Kandavu passage and then take the Great Circle track direct to Yokohama. *See* Route 743 (4).

Distance from Suva to Yokohama, 3,942 miles.

Route 656. Suva to Guam, Yap, Shanghai, Hong Kong and Manila.

In each case steer as directly as navigation permits to cross the Equator in about long. 154° 00′ E., and thence:

(1) To Shanghai via Guam.—Proceed by relevant part of Route 512 (b) (ii) to Guam, and join Route 513 (b) (ii), Sydney to Shanghai.

(2) To Hong Kong and Manila via Yap.—First steer as directly as navigation will permit to Yap and thence pass through Balintang channel and direct to Hong Kong, or through San Bernardino strait to Manila.

Distance from Suva to Shanghai, 4,479 miles; to Hong Kong, 4,519 miles; to Manila, 4,077 miles.

Route 657. Suva to Singapore

Take the reverse of Route 566 (1) to Thursday island and thence take Route 443 (a) or (b) to Singapore.

Distance from Suva to Singapore by 443 (a), 4,752 miles; by 443 (b), 4,710 miles.

Route 658. *—Reserved as spare.*

F. FROM GUAM.

Route 659. Guam to Honolulu

Take the reverse of Route 609.

Distance from Guam to Honolulu, 3,330 miles.

Route 660. Guam to North American ports

To San Diego and ports to the northward take a Great Circle track direct. To ports to the southward proceed via Honolulu *(see* Routes 659, 601, and 602).

Distance from Guam to Prince Rupert, 4,588 miles; to San Diego, 5,380 miles; to San Francisco, 5,053 miles; to Vancouver, via Queen Charlotte sound, 4,905 miles; via Juan de Fuca strait, 4,963 miles.

Distance from Guam to Manzanillo via Honolulu, 6,346 miles, via San Diego, 6,508 miles.

Route 661. Guam to Apia, Suva, or Tahiti

In each case take the reverse of the route (or to Apia the relevant part of the route) given below.

(1) To Apia or Tahiti.—Route 627.

(2) To Suva.—Route 656 (1).

Distance from Guam to Apia, 3,068 miles; to Suva, 2,800 miles; to Tahiti, 4,329 miles.

Route 662. Guam to Panama

Proceed either by a Great Circle track direct, or via Honolulu. The latter is only about 25 miles longer, Routes 659 and 602 being taken.

Distance from Guam to Panama (direct), 7,987 miles.

Route 663. Guam to New Zealand

Take the reverse of Route 585 (b).

Distance from Guam to Wellington, 3,770 miles.

Route 664. Guam to Brisbane, Sydney or Thursday island

In each case take the reverse of the relevant part of the route indicated below.

(1) To Brisbane.—Route 537 and 512 (b) (ii). *Distance*, 2,626 miles. Page 137.

(2) To Sydney.—Route 512 (b) (ii). *Distance*, 3,074 miles. Page 133.

(3) To Thursday island.—Route 562. *Distance*, 2,166 miles. Page 139.

Route 665. Guam to Yokohama

Steer the direct Rhumb line track passing between Kazan rettō and Ogasawara guntō, and thence eastward of the chain of islands nearest to Japan.

Distance from Guam to Yokohama, 1,353 miles.

Route 666. Guam to Shanghai

Steer the Great Circle track to a position lat. 25° 30′ N., long. 126° 30′ E., and thence direct to Steep Island passage and the Whangpoo. *See* Route 513 (b) (ii).

Distance from Guam to Shanghai, 1,684 miles.

Route 667. Guam to Hong Kong

Take a Great Circle track to a position lat. 21° 20, N., long. 121° 00′ E., in the Bashi channel, and thence proceed direct to destination. *See* Route 512 (b) (ii).

Distance, from Guam to Hong Kong, 1,800 miles.

Route 668. Guam to Manila and Singapore

Take a Great Circle track to San Bernardino strait and thence:—

(1) To Manila.—Pass through Verde Island passage and thence to destination.

(2) To Singapore.—Proceed as directly as navigation permits to pass through Verde Island passage and thence to join the China sea, Eastern route off North Danger (*Lat. 11° 27′ N., Long. 114° 21′ E.*). *See* Route 687 (2).

Distance from Guam to Manila, 1,497 miles; to Singapore, 2,667 miles.

Note.—The passage to Singapore may be made also by Surigao strait, Balabac strait, and the Api passage. The distance by this route is 2,597 miles.

Route 669.—*Reserved as spare.*

G. FROM YAP.

Route 670. Yap to Guam

Proceed as directly as navigation permits.

Distance from Yap to Guam, 451 miles.

Route 671. Yap to Honolulu, North American ports and Panama

In each case proceed via Guam (Route 670), taking or joining the route indicated below.

(1) To Honolulu.—Reverse of Route 609. *Distance*, 3,781 miles. Page 144.

(2) To North American ports.—Route 660. *Distances* as below. Page 148.

(3) To Panama.—Route 662. *Distance*, 8,438 miles. Page 148.

Distances from Yap.—Add 451 miles to the distances given in Route 660.

Route 672. Yap to Apia, Tahiti and Suva

In each case take the reverse of the route indicated below.

(1) To Apia and Tahiti.—Route 628. Page 146.

(2) To Suva.—Route 656 (2). Page 148.

Distance from Yap to Apia, 3,296 miles; to Suva, 2,921 miles; to Tahiti, 4,572 miles.

Route 673. Yap to New Zealand

Take the reverse of Route 584 (b).

Distance from Yap to Wellington, 3,792 miles.

Route 674. Yap to Australian ports

Take the reverse of the route indicated below.

(1) To Thursday island.—Route 562. Page 139.

(2) Sydney or Brisbane.—Route 512 (b) (i). Leave the route at Frederick reef when bound for Brisbane. *See* pages 133 and 137.

Distance from Yap to Brisbane, 2,570 miles; to Sydney, 3,085 miles; to Thursday island, 1,742 miles.

Route 675. Yap to Yokohama

Take a Rhumb line track direct.

Distance from Yap to Yokohama, 1,568 miles.

Route 676. Yap to Shanghai

Take a Great Circle track to a position in lat. 25° 30′ N., long. 126° 30′ E., and thence proceed direct to Steep Island passage and Shanghai.

Distance from Yap to Shanghai, 1,636 miles.

Route 677. Yap to Hong Kong

Take a Great Circle track to Balintang channel, and thence proceed direct to Hong Kong.

Distance from Yap to Hong Kong, 1,598 miles.

Route 678. Yap to Manila

Take a Rhumb line track to San Bernardino strait, and thence proceed via Verde Island passage to Manila.

Distance from Yap to Manila, 1,156 miles.

Route 679. Yap to Singapore

Take one of the three following routes.

(a) Via Surigao and Balabac straits and Api passage.

(b) Via Macassar strait, Karimata straat and Riouw straat.

(c) Via Manila and China sea.—Routes 678 and 721.

Distance from Yap to Singapore by (a), 2,200 miles; by (b), 2,497 miles; by (c), 2,486 miles.

Notes.—By not calling at Manila in (c) above there is a saving of about 160 miles.

Surigao strait.—This is the only passage for large vessels from the Pacific to the interior waters of the Philippine archipelago, with the exception of San Bernardino strait; it is of advantage to vessels going to the southern Philippines or to the Sulu sea, and is sometimes used by steamers from Australia who wish to escape the full force of the North-East Monsoon.

The main strait is safe and deep throughout its length, and the shores of the islands that border it are steep-to. The entrance to the strait from the Pacific is between Homonhon island to the north and Dinagat island to the south; the western side of the strait is formed by islands of Leite and Panaon, and the eastern side by the islands lying northward of the north-east part of Mindanao.

Note.—A brief description of many of the channels into, and through the Eastern archipelago is given in Chapter II. of Section C., Part II.

Route 680.—*Reserved as spare.*

Route 681.—*Reserved as spare.*

See Section D. Part III. Index on pages 357 and 358.

SECTION B. PART IV.

Chapter III

ROUTES FROM THE ASIATIC MAINLAND, THE PHILIPPINES AND JAPAN

(i) ROUTES FROM SINGAPORE

Routes from Singapore to ports in the Indian ocean are given in Part III, Chapter V.

Routes from Singapore to ports in the north, west, and south of Australia are given in Part III, Chapter V; to ports on the east coast the routes are summarised below.

Route 682. Singapore to Thursday island, Brisbane and Sydney

(1) To THURSDAY ISLAND.—Take Route 441 (a), (b), or (c).

(2) To BRISBANE.—Take Route 441 as above to Thursday island and thence Route 444 (1).

(3) To SYDNEY.—Proceed to Thursday island as in (1) above and thence take Route 507 (a) reversed.

Note.—The passage to Sydney may be made also via Cape Leeuwin, the distance is only 80 miles more, but an adverse current and more stormy weather can be expected on part of the route.

Distance from Singapore to Thursday island 2,504 miles; to Brisbane, 3,821 miles; to Sydney, 4,224 miles.

Route 683. Singapore to Yap or Guam

(1) To YAP.—Take the reverse of Route 679. *Distance* using 679 (a), 2,200 miles.

(2) To GUAM.—Take the reverse of Route 668 (2). *Distance*, 2,667 miles.

Note.—Via Surigao strait the distance us 2,597 miles.

Route 684. Singapore to Suva, Apia or Tahiti

In each case first take Route 441 to Thursday island, thence take routes as follows:—

(1) To SUVA.—Route 566 (1).

(2) To APIA.—Route 566 (2).

(3) To TAHITI.—Route 567.

Distance, from Singapore to Suva, 4,710 miles; to Apia, 5,275 miles; to Tahiti, 6,537 miles.

Route 685. Singapore to Honolulu

(a) Via Bashi channel.—Take the Main Route of the China sea (Route 687 (1)), and after passing Macclesfield bank, steer a direct course for a position in lat. 21° 20′ N., long. 121° 00′ E. in the Bashi channel. Thence take a Great Circle track to destination.

(b) Via Guam.—Take Route 683 (2) to Guam, and thence the reverse of Route 609.

Distance from Singapore to Honolulu by (a), 6,049 miles; by (b), 5,997 miles; using Surigao strait, Balabac strait and Api passage, 5,927 miles. *See* Note under Route 668 (2).

Route 686. Singapore to ports of the Eastern Archipelago

(1) To AMBON.—Proceed via Riouw, Karimata and Saleier straten and between Boeton and Toekang Besi eilanden. *Distance*, 1,627 miles.

Note.—This is probably a better route, in both monsoons, to Molukken archipel, than by proceeding northward of Borneo.

(2) To MACASSAR.—Proceed via Riouw and Karimata straten and the Java sea. *Distance*, 1,063 miles.

(3) To LOMBOK STRAAT.—Proceed via Riouw, Karimata and Sapoedi straten. *Distance*, 963 miles.

(4) To SURABAYA.—Pass through Riouw and Karimata straten and Java sea. *Distance*, 759 miles.

(5) To SOENDA STRAAT and DJAKARTA (BATAVIA).—Pass through Doerian, Berhala and Banka straten. *Distance* to Soenda straat (Dwars in den weg (Thwartway island)), 523 miles; to Djakarta, 525 miles.

(6) To BALIK PAPAN.—Proceed via Riouw and Karimata straten and through the Java sea to Macassar strait. *Distance*, 1,052 miles.

(7) To TARAKAN.—Proceed either round the north end of Borneo, via Api passage, Balabac strait and Sibutu passage, or round the south end of Borneo via Riouw straat, Karimata straat, Java sea and Macassar strait. *Distance*, via N. of Borneo, 1,309 miles; via S. of Borneo, 1,497 miles.

(8) To Sandakan.—Proceed via Api passage and Balabac strait. *Distance*, 1,061 miles.

For detailed information as to all the passages given above, *see* the following books:—

For Singapore and Singapore strait and approaches; Malacca Strait Pilot.

For Riouw, Doerian, Berhala, Banka, Gaspar Karimata and Soenda straten, Eastern Archipelago Pilot, Vol. IV.

For Soenda straat, Java sea, Saleier straat, and Macassar strait, with Balik Papan and Tarakan; Eastern Archipelago Pilot, Vol. II.

For Ambon, Banda sea; and Molucca sea; Eastern Archipelago Pilot, Vol. III.

For Api passage, and route along the north-west coast of Borneo, as far as Balabac strait; China Sea Pilot, Vol. II.

For Balabac strait, Sandakan and Sibutu passage; Eastern Archipelago Pilot, Vol. I.

See also Chapter II. of Section C., Part II.

Route 687. Singapore to the northward through the China sea; Main Route, Eastern Route, and Palawan passage

General remarks.—Towards the centre of the southern portion of the China sea, there is a considerable area of unsurveyed and dangerous ground, known to be encumbered with coral reefs and banks, which should be avoided. This area is described in China Sea Pilot, Vol. II, within the limits of the pecked line enclosing the "Dangerous ground." Vessels are recommended to follow the routes shown on the charts of the China sea, as far as practicable.

There are three principal routes, known respectively as the *Main route*, the *Eastern route* and the *Palawan passage*.

(1) *The Main route* (both monsoons).—Mail and other full-powered steam vessels take the Main route; that is between Pulau Aur and Anamba islands, eastward of Pulau Sapatu, and thence between Macclesfield bank and the Paracel group to Hong Kong, and other ports to northward.

(2) *The Eastern route* (North-East Monsoon—Alternative route).—The route taken by many full-powered steamers in the North-East Monsoon, and recommended for vessels of moderate power, is, after passing westward of the Anamba islands, to steer

about 30 miles westward of the Prince of Wales bank and North Danger reef and thence about the same distance eastward of Macclesfield bank. The current is decidedly favourable in this track, from about lat. 10° N., except possibly when the monsoon is unusually strong.

(3) *The Palawan passage* (Low-powered vessels).—

CAUTION.—Mariners are warned that a strong north-west set is experienced in the southern part of the Palawan passage westward and north-westward of Balabac and North Balabac strait during the height of the North-East Monsoon.

After leaving Singapore, steer to pass about 5 miles northward of the light on Subi kechil, carefully allowing for the current, then steer to make good a 077° course for a distance of about 230 miles, whence he course is clear up to the entrance of the Palawan passage, passing between the South Luconia shoals and Tanjong Baram, and keeping as close as circumstances may make convenient to the Borneo coast, until abreast of that point. Thence a course should be shaped to keep seaward of the 100 fathoms ($182^{m}9$) edge of the bank fronting Palawan, to Balabac island; thence midway between the Royal Captain shoal and the edge of the bank; this portion, about 28 miles in width, is the narrowest and most dangerous part of the channel.

An alternative route is as follows:—On leaving Singapore, pass southward of Kayu Ara, the southernmost of the Pengibu islands, then steer to sight the light on St. Petrus, carefully allowing for the currnet, and afterwards steer for Api passage, keeping towards Merundung rather than Tanjong Api. Having passed Merundung and Tanjong Datu, proceed as above.

If the wind be well to the southward, and the weather clear, Balabac island may be approached sufficiently near, in order to obtain a good observation of the land, but caution is necessary not to go within 12 miles of it, as soundings of 26 and 20 fathoms ($47^{m}6$ and $36^{m}6$) extend to that distance off, in a westerly direction from the peak, having shoal patches immediately inside them.

If the wind be to the westward, with thick cloudy weather, Balabac island should not be approached nearer than 30 miles, as westerly winds usually force a strong easterly current through the passages. Off the south-west end of Palawan, it is not unusual, particularly in squalls, for the wind to veer to W.N.W., and sometimes N.W., blowing with violence and placing the vessel on a lee shore with respect to the shoals inside the edge of the bank. This weather generally prevails off the south-west end of Palawan, about September and October, rendering it uncertain and difficult to make the narrowest part of the channel, owing to the land being obscured, especially if the position of the vessel has not been checked by observations. Under these circumstances, it is advisable to proceed with caution, regulating the speed of the vessel so as to pass the Royal Captain shoal during daylight.

If uncertain of the vessel's position, endeavour to get soundings on the edge of the bank north-westward of Balabac island, the safest part to approach for this purpose being about the elbow, on the parallel of 8° 30′ N., or immediately to the southward of it; for it is believed that the edge of the portion of the bank with Balabac peak bearing from 120° to 160°, comprising a distance of 25 miles, is free from danger. If the peak be obscured the same bearings of the body of the island will answer.

Experience shows, however, that in the thickest weather the land is seldom totally obscured for any length of time, but generally presents a well-defined outline between the squalls.

Having obtained soundings (which will be about 90 fathoms ($164^{m}6$), if close to the edge of the bank, and from 45 to 55 fathoms ($82^{m}3$ to $100^{m}6$), sand, if inside), haul off to the north-westward, to give the edge a berth of about 10 miles and then steer a mid-channel course.

Having passed Bombay shoal, steer a course parallel with the edge of the bank, preserving a distance of 8 to 12 miles from it, and 27 to 30 miles from the land, or nearer, if convenient, and the peaks on Palawan are sufficiently distinct to get good cross bearings.

It is, however, not desirable to get too close, as the edge of the bank, in about the parallels of 9° 30′ and 10° N., is not uniform in its outline, and several rocky parches lie within a mile, and in some places only 3 cables from the edge.

The course is slightly more northerly when abreast Ulugan bay, where the bank extends 28 miles from the shore.

Proceeding northward from the Palawan passage, it is customary to steer along the west coast of Luzon to Cape Bolinao, lat. 16° 22′ N., and thence direct to Hong Kong, passing to leeward of Pratas island and reef.

Distances from Singapore by the above routes are given below, but *see also* Route 688, Singapore to ports in the Philippine islands, Route 689, Singapore to Hong Kong, and Route 691, Singapore to Shanghai.

To Manila, by (3) above, 1,375 miles.

To Hong Kong, by (1), 1,459 miles; by (2), 1,540 miles; by (3), 1,925 miles.

To Shanghai, by (1), 2,187 miles; by (2), 2,160 miles.

Note.—A call at Manila on the passage to Hong Kong increases the total distance by 80 miles.

Route 688. Singapore to ports in the Philippine islands

(1) To MANILA.

(a) Eastern Route.—Follow the " Eastern Route " described in Route 687 (2), as far as the North Danger reef, after rounding which at about 30 miles distance, steer a direct Rhumb line course to destination.

(b) North-East Monsoon. Alternative route via Palawan passage.—Follow the Palawan passage as described in Route 687 (3) and thence proceed direct to Manila.

(2) To ILOILO, CEBU (SEBU) or BASILAN STRAIT.—Follow the Palawan passage to Balabac strait and there enter the Sulu sea, proceeding as directly as navigation permits to destination.

Distance from Singapore to Manila by (1) (a), 1,330 miles; by (1) (b), 1,375 miles; to Iloilo, 1,297 miles; to Cebu, 1,376 miles; to Basilan strait, 1,212 miles.

Note.—The distance (in each case) is lessened by 23 miles, by passing between Great Natuna and South Natuna islands, instead of taking the Api passage between the South Natuna islands and the Borneo coast.

CAUTION. See Caution at the beginning of Sub-section (iv) of this Chapter, on page 157.

Route 689. Singapore to Hong Kong

(a) Full-powered vessels.

(i) Usual route. Both Monsoons.—The usual track in both monsoons is the Main Route (*see* Route 687 (1)), passing westward of the Anamba islands, and between the Paracel islands and Macclesfield bank.

(ii) Alternative route. South-West Monsoon.—During the strength of the South-West Monsoon, rather smoother water will be found by keeping closer to the coast of Cochin China, and passing westward of the Paracel islands. By this route the distance is lessened by about 20 miles.

(iii) Alternative route. North-East Monsoon.—Take the " Eastern Route." *See* Route 687 (2).

(b) Low-powered vessels.

(i) South-West Monsoon (Alternative to Main Route).—During the strength of the monsoon, the Inner Route along the coast of Cochin China may be adopted, with the advantage of obtaining smooth water. Proceeding by the Inner or Cochin China Route, steer from Pulau Aur along the coast to Pulau Redang, thence across the Gulf of Thailand (Siam), and along the coasts of Cambodia and Cochin China, keeping the latter aboard to Cap Tourane; thence steer for the south-west part of Hainan, coasting along the east side of this island and passing between it and the Taya islands; then steer to make the coast of China about Tinpak (Tien pak), or about Huilingsan. The islands thence to Hong Kong may be coasted along at discretion, and shelter may be found amongst them on emergency.

CAUTION. *Fogs.*—The coasts of Annam and Tongking are subject to fogs and, during the rainy season, the high land is often masked; this, coupled with the varying currents, renders it necessary to sound continuously and to take every precaution when navigating near the shore.

(ii) North-East Monsoon.—Take the Palawan passage route *(See* Route 687 (3)), and thence proceed past Manila to destination.

Distance from Singapore to Hong Kong by (a) (i), 1,459 miles; by (a) (ii), 1,438 miles; by (a) (iii), 1,540 miles; by (b) (i), 1,600 miles; by (b) (ii), 1,925 miles.

Route 690. Singapore to Bangkok or Saigon

(a) Usual route. Both Monsoons.—Proceed as directly as navigation permits.

(b) Low-powered vessels.

(i) South-West Monsoon.—Having cleared Singapore strait, if bound to the Gulf of Thailand (Siam), first steer to make Pulau Redang, and thence along the western shores of the gulf.

If bound to Saigon, pass westward of Pulau Condore, and thence to Saigon.

(ii) North-East Monsoon.—Low-powered vessels generally steer a direct course during this monsoon to the Gulf of Thailand and to Saigon; but during the strength of the monsoon, in December and January, it would seen advantageous to pass east of the Anamba islands if bound to the Gulf of Thailand, and east of the Natuna islands if bound to Saigon.

Distance from Singapore to Bangkok river (outer bar), 800 miles; to Saigon, 644 miles.

Route 691. Singapore to Shanghai

(a) South-West Monsoon.—Proceed as directly as possible; by the Main Route of the China sea *(See* Route 687 (1)) to a point northward of Macclesfield bank in about lat. 17° 30′ N.; thence through Formosa strait passing west of Formosa banks and thence to Steep Island passage.

(b) North-East Monsoon.—Take the Main Route, as above, but keeping as close inshore to the coast of China as safe navigation permits. *See* navigational notes below. *See also* (c), next column.

In a strong North-east Monsoon the track eastward of Macclesfield bank through Pescadores channel and northward along the coast of Formosa, may be taken, provided that Pescadores channel is made during daylight.

In addition to getting smooth water and a favourable current, another great advantage obtained by vessels using Pescadores channel is the absence of the big fleets of fishing junks which are encountered along the China coast and which, on a dark night, are a source of great anxiety. The channel is well lighted.

Distance from Singapore to Shanghai by (a), 2,187 miles; by (b), 2,160 miles.

Navigational Notes. See China sea Pilot, Vols. I. and III.

(i) Proceeding northward along the coast of China, against a strong North-East Monsoon keep as close to the coast as safely permits until beyond the Chusan archipelago. *See* also (c) below.

(ii) In daylight and clear weather pass inside Lamock islands and the Brothers; at night it is advisable to go outside them. Guard against an indraught whilst passing South Merope during the rising tide; pass inside Ockseu islands, near Turnabout island and thence direct to Tung yung, avoiding Tungsha. In the north-east monsoon the south-westerly current is very strong between Turnabout island and Tung yung, and has been known to run at the rate of 4 to 5 knots. There is an indraught into all the deep bights on the coast during the rising tide.

From Tung yung, pass eastward of the outer islands, but on either side of Yu shan lieh tao (Hieshan islands), whence steer to a position 4 miles eastward of Tongting island lighthouse and thence to Steep Island pass.

(iii) Vessels of considerable draught steer northward from Turnabout island, giving a proper berth to the rocks off Chu shan (Hai tan island), and pass inside the Pai chuan lieh tao (Pai kuen), Matsu or Nan kan tang, and Pai sha; thence through the channel between Cony and Spider islands and between Cony and Ma Chick (southward of Double Peak island) islands, and south-eastward of Piseang or Tsi sing and Tai (Tae) islands, and the Seven Stars islets adjoining.

(iv) When approaching Steep island, and thence through the islands, it is necessary to allow for the set of the tidal streams; the arrows on the chart indicate their normal rate and direction.

(v) In thick weather, with the land obscured it is advisable to anchor before having run the distance to Steep island; good anchorage can be obtained in from 15 to 20 fathoms ($27^{m}4$ to $36^{m}6$) mud; as the streams are very strong the ship must be brought head-to before anchoring.

If keeping seaward outside the islands in thick weather, it is necessary to pass eastward of Barren islets, giving them a very wide berth, and then it is difficult to obtain the ship's position again.

(vi) Video island is an excellent mark; it is the best to make from the southward as it is steep on its southern side.

(c) North-East Monsoon. Coast of China, northward from lat. 22° *N.*

(i) Vessels of 20 *feet* ($6^{m}1$) *draught or under.*—By this route much of the heavy sea is avoided.

Passing half a mile off Fokai point, steer towards Chilang point, leaving Pauk Piah to the southward and Reef islets one mile to the northward. Pass 3 miles southward of Siki (*Lat. 22° 42′ N., Long. 115° 47′ E.*), and follow the coast at about 4 miles distant, giving a good berth to Workfield rock (Reported (1904)) up to Breaker point, when steer to pass 2 miles eastward of Good Hope cape.

Then steer for Brig island (*Lat. 23° 28′ N., Long. 116° 55′ E.*), passing eastward of Dove rock; thence through Clipper road and northward of Namoa island and Dioyu reef to Owick point. Then pass outside Bell islet, inside Cliff and Square islets, outside the rocky ground of 5 fathoms ($9^{m}1$) southward of Cone point, to Kau li tau shan or Thunder head. Continue northward to pass inside Ockseu and outside Turnabout islands, and thence follow the directions given in Navigational Note (iii) under (b) above as far as the Seven Stars islets (*Lat. 27° 03′ N., Long. 120° 51′ E.*).

After passing Turret islet and the Namki group, proceed southward and eastward of Piki shan, or pass about 1½ miles eastward of Tung kua yu (Shroud island), and proceed northward of Piki shan, with Tung kua yu lighthouse bearing 246°, astern; in both cases then steer to pass about 2 miles eastward of Soudan island (*Lat. 28° 16′ N., Long. 121° 44′ E.*).

Leave Chiku shan (Chikhok) one mile to the westward and steer direct to pass 1½ miles eastward of Tung chu (*Lat. 28° 32′ N., Long. 121° 55′ E.*) and Tan tou shan (tau san), and northward through Nu pi shan channel, westward of Chiu shan lieh tao (Kue shan islands).

The track continues through Gough pass (*Lat. 29° 46′ N., Long. 122° 02′ E.*), round Ketau point, through Tower Hill and Blackwall channels, and westward of Dunsterville and Yu Lsing nao (West Volcano) islets, and between Chi chu lieh tao (Rugged) islands and Bassett and Hsu Kung tao (Morrison) islands. Pass 4 miles eastward of Ta chi shan (Gutzlaff), and continue to the Yangtze as directly as prudent navigation permits.

(*ii*) *Vessels of over* 20 *feet draught, or at night.*—Pass outside Chiu shan lieh tao (Kue shan), between Tongting and Piting, through Steep Island pass and Bonham strait (*Lat. 30° 36′ N., Long. 122° 24′ E.*).

CAUTION. *Coast of China.*—Several vessels have stranded on outlying islands on the coast of China between Fokai point and the entrance to the Yangtze kiang, and generally the stranding would not have occurred if the vessel had been kept in a proper depth of water; attention is therefore called to the necessity of constantly sounding in thick or misty weather. Many lighthouses on the islands are at a considerable height above the sea, and often the upper parts of the islands and the lights are obscured by fog; so, as a general rule, if a light is not seen when a vessel is within its distance of visibility, sound at once, even if the weather is apparently quite clear, and proceed out to a safe depth, continuing sounding until the position is ascertained.

Route 692. Singapore to ports in Japan

(1) To Nagasaki.

(*a*) *Direct route.*—The most direct route is to pass eastward of the Macclesfield bank to the south point of Formosa, and northward in the Kuro shio current along the eastern coast of Formosa to destination as directly as navigation permits.

(*b*) *Via Formosa strait.*—If the Main route of the China sea and Formosa strait be taken, the distance is increased by about 100 miles. *See* Routes 687 (1) and 691 (Navigational Notes).

(2) To Yokohama.

(*a*) *Via Balintang channel.*—Steer westward of Prince Consort bank to pass through the Balintang channel, northward of the Philippine islands, and thence as directly as navigation permits to destination.

(*b*) *Via Formosa strait.*—By proceeding by the Main route of the China sea and Formosa strait, the distance is increased by about 150 miles, but a favourable current (Kuro shio) will be obtained. *See* Route 687 (1) and Navigational Notes in Route 691.

Distance from Singapore to Nagasaki by 1 (a), 2,413 miles; to Yokohama by 2 (a), 2,888 miles.

Route 693. Singapore to North American ports and Panama

(1) To Dutch harbour.—Proceed via Yokohama. *See* Route 692 (2) to Yokohama, and Route 739, Yokohama to Dutch harbour.

Distance from Singapore to Yokohama, 2,888 miles; on to Dutch harbour (via south of Aleutian islands), 2,616 miles. *Total distance*, 5,504 miles.

By making the passage north of the Aleutian islands the distance is decreased by about 68 miles.

(2) To San Francisco or San Diego.—Proceed via Yokohama. *See* Route 692 (2) to Yokohama, and Route 740, Yokohama to San Francisco or San Diego.

Total distance from Singapore to San Francisco, 7,424 miles; to San Diego, 7,811 miles.

(3) To Prince Rupert or Vancouver.—Take Route 692 (2) to Yokohama and thence Route 741 to destination.

Total distance from Singapore to Prince Rupert, 6,918 miles; to Vancouver, 7,233 miles.

(4) To Panama.

(*a*) *Via Yokohama.*—Take Route 692 (2) to Yokohama, and thence Route 744 to Panama.

(*b*) *Via Honolulu.*—Take Route 685 (a) or (b) to Honolulu, and thence Route 602 to Panama.

(*c*) *Via Yokohama and Honolulu.*—Take Route 692 (2) to Yokohama, and thence Route 743 (1) to Honolulu and Route 602 onwards to Panama.

Note.—Vessels with a limited radius of action should take one of alternative routes from Honolulu. *See* Route 602.

Distance from Singapore to Panama via 4 (a), 10,568 miles; via 4 (b), 10,577 miles; via 4 (c), 10,962 miles.

Note.—By making the voyage to San Francisco via Dutch harbour, passing north of the Aleutians the distance is *increased* by about 130 miles, but to Prince Rupert and Vancouver the distance is *decreased* by about 140 and 90 miles respectively.

Route 694.—*Reserved as spare.*

Route 695.—*Reserved as spare.*

(ii) ROUTES FROM BANGKOK AND SAIGON

Route 696. Bangkok or Saigon to ports in the China sea, Singapore, Manila, and Eastern archipelago

(*a*) *Usual routes.*—In all cases proceed as directly as navigation permits.

(*b*) *Low-powered vessels.*

(*i*) *South-West Monsoon.*—Vessels with low steam power, if proceeding from Bangkok to Singapore, keep along the western shore of the gulf to Great Redang island; thence inside Pulau Tenggol and close along shore to Singapore. From Saigon, steer along the Cambodia coast as far as the Brothers or Pulau Obi, then across the Gulf of Thailand (Siam) to the Malay coast, and passing inside Pulau Tioman and Pulau Sibu, keep along the coast to Singapore strait.

(*ii*) *North-East Monsoon.*—Vessels with low steam power, from Bangkok, steer along the eastern side of the gulf past Pulau Wai (*Lat. 9° 55′ N., Long. 102° 53′ E.*) to Pulau Panjang; thence eastward of Pulau Tenggol to Singapore strait. If from Saigon, pass eastward of Pulau Condore, and thence direct to Pulau Aur and Singapore strait.

Routes from Bangkok or Saigon to other ports should be taken by proceeding as directly as safe navigation permits to join, according to season and monsoon, the routes from Singapore, when proceeding northward and eastward; and from Hong Kong, when proceeding southward and south-eastward.

Distance from Bangkok to Balik Papan, 1,744 miles; to Djakarta (Batavia), 1,259 miles; to Hong Kong, 1,458 miles; to Manila, 1,429 miles; to Saigon, 647 miles; to Singapore, 800 miles.

Distance from Saigon to Balik Papan, via Karimata straat, 1,492 miles, via Balabac strait, 1,523 miles; to Bangkok, 647 miles; to Djakarta (Batavia), 1,032 miles; to Hong Kong, 925 miles; to Manila, 905 miles; to Singapore, 644 miles.

See Caution as to Fogs under Route 689 (b) (i).

(iii) ROUTES FROM HONG KONG

Route 697. Hong Kong to Saigon or Bangkok

Take the reverse of Route 696, passing in each case to the westward of the Paracel islands.

See Caution as to Fogs under Route 689 (b) (i).

Distance from Hong Kong to Saigon, 925 miles; to Bangkok, 1,458 miles.

Route 698. Hong Kong to Singapore

(a) North-East Monsoon.

(i) Main route.—Take the Main route of the China sea, Route 687 (1), passing between Macclesfield bank and the Paracel islands and thence eastward of Pulau Sapatu and Pulau Aur to Singapore.

(ii) Alternative route (generally adopted).—Pass about 30 miles westward of the Paracels, as in the South-West Monsoon, *see (b)*; thence pass 15 to 20 miles east of Cape Varella, and east of Pulau Sapatu; thence to Pulau Aur and Singapore strait. This route is said to be generally adopted, a favourable current being found along the coast. Some vessels take this route in both monsoons, sighting the land at Cape Padaran (*Lat. 11° 22′ N., Long. 109° 02′ E.*), and at Pulau Condore (*Lat. 8° 40′ N., Long. 106° 42′ E.*).

Between Cape Varella and Cape Padaran the favourable current referred to above has been known, in the month of February, to attain a rate of 2½ knots.

(b) South-West Monsoon.—Full-powered steam vessels.—After leaving Hong Kong, and passing about 30 miles west of Paracel islands and reefs, if the monsoon be strong, steer to pass within sight of the land in the vicinity of Kulao Ré (Rai), keeping about 10 miles off-shore as far as Cape Padaran, whence steer to pass about 3 miles east of Pulau Aur; thence to Singapore strait. Or, from westward of the Paracels, shape course direct for Cape Varella light.

Notes.—At night in tolerably clear weather a vessel may pass near to Pulau Cecir de Mer, westward of the Catwicks and Pulau Sapatu, thence to Pulau Aur. During thick weather it is advisable to pass eastward of Pulau Sapatu.

Some vessels take Route (a) (ii) above in both monsoons.

See Note as to Fogs under Route 689 (b) (i).

(c) North-East Monsoon.—Low-powered vessels.—Take the Main route (*see* (a) (i) above), allowing for a south-westerly set of current on leaving the China coast.

(d) South-West Monsoon.—Low-powered vessels.—Take one of the following:

(i) Route (b) above.

(ii) Route 687 (3) in reverse, that is via Palawan passage.

Distance from Hong Kong to Singapore by (a) (i) or (a) (ii), 1,459 miles; by (b), 1,438 miles; by (c), 1,459 miles; by (d) (i), 1,438 miles; by (d) (ii), 1,925 miles.

For routes onward into the Indian ocean, see Section B, Part III, Chapter V.

Route 699. Hong Kong to ports of the Eastern archipelago

(1) To SOENDA STRAAT, DJAKARTA (BATAVIA), or SURABAYA.—Take the Main route of the China sea (Route 687) (i) reversed), and thence proceed by Gaspar straten to Soenda straat or Djakarta, and by Karimata straat to Surabaya.

(2) To SANDAKAN.—Take the Palawan passage as far as Balabac strait (Route 687 (3) reversed) and thence proceed as directly as navigation permits to destination.

(3) To TARAKAN, BALIK PAPAN or MACASSAR.—*See* Note at the beginning of sub-section (iv) of this chapter on page 157.

(a) Via Mindoro strait.—Pass through Mindoro strait, or Verde Island passage into the Sulu sea, and thence by Sibutu passage and Macassar strait to destination.

(b) Via Balabac strait.—Proceed as in (2) above through the Balabac strait, past Sandakan, into the Sulu sea; each distance by this route is increased by about 30 miles.

Note.—Sibutu passage.—Vessels passing from Balabac strait, through the Sulu sea towards Macassar strait will find it convenient to use the channel between the Sibutu islands, south of the easternmost point of Borneo, and Tawitawi islands. This channel is 16 miles wide, quite safe, and easy of navigation both by day and night; but the tidal streams set through the channel with great force.

(4) To AMBON.—Proceed via Mindoro strait, or Verde Island passage, Basilan strait, and Molucca sea.

Distances from Hong Kong:—

To Ambon, 1,794 miles; to Balik Papan, 1,674 miles; to Djakarta, 1,795 miles; to Macassar, 1,850 miles; to Straat Soenda, 1,808 miles; to Surabaya, 1,938 miles; to Tarakan, 1,404 miles.

Route 700. Hong Kong to Thursday island and Port Darwin

The route now generally adopted is as follows:—

From Hong Kong, steer across the China sea for Mindoro strait, and pass about 4 miles west of Cape Kalavite; thence through Apo East pass between Apo reef and Mindoro island—a safe and good channel. Then proceed through the Sulu sea, between the Cuyo islands and Sultan bank, east of Sombrero rock (*Lat. 10° 43′ N., Long. 121° 33′ E.*) and 6 miles west of Nogas island off the south-west end of Panay. From this point a southerly course should be steered for the south-west extreme of Mindanao and Basilan strait, leaving the Sultana and Nicholson banks, on which there are depths of 2½ and 3 fathoms ($4^{m}6$ to $5^{m}5$), to the westward. *See* Note at the beginning of sub-section (iv) of this Chapter on page 157.

In passing through Basilan strait, either channel north or south of Santa Cruz island may be taken, but the northern is preferred. On leaving the strait, a course should be steered for the passage between Biaro and Bangka, or through Straat Bangka off the north-east point of Celebes. Then proceed southward through the Molucca sea between the Soela eilanden and Obi Major, and through Straat Manipa. Thence:—

(1) To THURSDAY ISLAND.

(a) Usual route.—Steer across the Banda sea for the Arafura sea, passing between Kai and Arœ eilanden to the north-eastward, and Tanimbar eilanden to the south-westward. Manoek (*Lat. 5° 33′ S., Long. 130° 18′ E.*), lying near this track, is a volcanic island 880 feet ($268^{m}2$) in height and has no dangers in its vicinity, but the south-west part of Aroe eilanden must not be approached within 15 miles, as the Blackburne shoals, with only 1¼ to 3 fathoms ($2^{m}3$ to $5^{m}5$) water over them, lie some 9 miles off the coast; the shoalest head of these shoals breaks with a little sea, but the others are not indicated by breaking or ripplings at ordinary times.

From the Arafura sea a course should be steered to make Carpentaria Light Vessel west of Torres strait, avoiding the unexamined shoals 30 and 105 miles westward of Le Cher bank, and then through Torres strait as directed in Australia Pilot, Vol. III.

(b) Alternative route in South-East Monsoon (July and August).—In order to escape the South-East Monsoon in the above months, when it blows strong

and raises a high sea in the Arafura sea, some steamships, after passing Obi Major, have taken the passage north of Ceram, the Kai, and Aroe eilanden, passing Kaap Valsch at a distance of 30 miles, as mudbanks extend to a great distance from the cape. This passage has the advantage of smooth water, but is a little longer and less well known than the passage through the Banda sea.

(2) To PORT DARWIN.—If bound to Port Darwin take the same route as described before (1) above as far as Manipa straat, whence steer to pass east of Damar, and between Sermata and Babar; and from Sermata to round Cape Fourcroy (*see* Australia Pilot, Vol. V) avoiding the Flinders and other shoals in the Arafura sea.

Distance from Hong Kong to Thursday island, by (1) (a), 2,729 miles; to Port Darwin, 2,341 miles.

Route 701. **Hong Kong to Brisbane, Sydney, Melbourne, Hobart and Wellington**

(1) To BRISBANE.

(a) Via Thursday island.—Take Route 700 (1) to Thursday island, and thence proceed by the Inner route to Brisbane (*see* Routes 531 (a) and 507 (a)).

(b) Via Yap.—Take Route 704 (i) to Yap, and thence the reverse of Route 674 (2) to Brisbane.

(2) To SYDNEY.

(a) Via Thursday island.—Take Route 700 (1) to Thursday island, and thence the reverse of Route 507 (a), (b) (i), or (b) (ii).

(b) Via Yap.—Take the reverse of Route 512 (b) (i).

(c) Via Guam.—Take the reverse of Route 512 (b) (ii).

(d) Via Soenda straat and Cape Leeuwin.—Take Route 699 (1) to Soenda straat; thence proceed by the relevant part of Route 440 (1) to Cape Leeuwin, and by Route 453 (1) onwards to Sydney. This route is very much longer than either (a), (b), or (c).

(3) To MELBOURNE or HOBART.

(a) Via Thursday island.—Proceed as in (2) (a) as far as Sydney, and thence as directly as navigation permits to either destination.

(b) Via Soenda straat and Cape Leeuwin.—Proceed as for (2) (d) as far as Cape Leeuwin and thence by Route 453 (1) to Melbourne, or Route 453 (2) to Hobart.

Note.—Route (3) (a) is only 113 miles shorter to Melbourne, or 188 shorter to Hobart, than (3) (b).

(4) To WELLINGTON.

(a) Via Thursday island.—Take Route 700 (1) to Thursday island, and thence Route 568 (a), or (b) to Wellington.

(b) Via Yap.—Take the reverse of Route 584 (b).

Note.—Route (4) (a) is only 49 miles shorter than (4) (b).

Distances from Hong Kong:—

To Brisbane via (1) (a), 4,046 miles; (1) (b), 4,330 miles.

To Sydney via (2) (a), 4,449 miles; (2) (b), 4,683 miles; (2) (c), 4,874 miles; (2) (d), 5,586 miles.

To Melbourne via (3) (a), 5,014 miles; (3) (b), 5,127 miles.

To Hobart via (3) (a), 5,066 miles; (3) (b), 5,252 miles.

To Wellington via (4) (a) 5,341 miles; (4) (b), 5,390 miles.

Route 702. **Hong Kong to Fremantle or Adelaide**

To either port proceed by Route 699 (1) to Soenda straat and thence take Route 440 (1) to Fremantle or to Cape Leeuwin.

From Cape Leeuwin take the relevant part of Route 452 (2) to Adelaide.

Distance from Hong Kong to Fremantle, 3,505 miles; to Adelaide, 4,789 miles.

Route 703. **Hong Kong to ports of Philippine islands**

See Note at the beginning of sub-section (iv) of this chapter on page 157.

(1) To MANILA.—In both monsoons, proceed as directly as navigation permits. *See* China Pilot, Vol. II.

CAUTION. The Pratas reef (*Lat. 20° 42′ N., Long. 116° 43′ E.*), lying in the route between Hong Kong and Manila is a serious danger, especially in the North-East Monsoon, when strong gales and thick clouds are sometimes prevalent for weeks together. There are no soundings to indicate a near approach but the safest quarter from which to make the reef is from the westward, for the currents on this side run, invariably, dead to lee-ward (to south-west or to north-east, according to monsoon). Conning from aloft, with the light favourable, the bottom can be seen in 10 fathoms ($18^{m}3$). The island is visible 12 miles in clear weather, but seldom more than 5 miles during the North-East Monsoon haze.

(2) To ILOILO.

(a) North-East Monsoon.—Take the Verde Island passage to Dumali point (*Lat. 13° 07′ N., Long. 121° 34′ E.*), and then steer south along the west coast of Panay to destination.

(b) South-West Monsoon.—From Dumali point steer to pass south of Simara island, and between Tablas and Romblon, then on between Hintotolo and Zapato islands, and then, turning southward, proceed along the east coast of Panay to Iloilo.

(3) To CEBU (SEBU).—Take the route given above in (1) as far as Hintotolo island; from there proceed to Malapascua, which lies north-west of Cebu island, and thence south to Cebu.

(4) To SULU or BASILAN STRAIT.—Enter the Sulu sea either by (a) Mindoro strait or (b) Verde Island passage according to monsoon, and then proceed as directly as navigation permits to either destination.

Distance from Hong Kong to Manila, 630 miles; to Iloilo by (2) (a), 950 miles; by (2) (b), 960 miles; to Cebu by (3), 962 miles; to Sulu by (4), 1,100 miles; to Basilan strait by (4), 1,050 miles.

(By Verde island passage and eastward of Mindoro the distance in (4) is increased by about 70 miles.)

Route 704. **Hong Kong to Yap, Suva, Apia and Tahiti**

(1) To YAP.—Take the reverse of Route 677. *Distance*, 1,598 miles.

(2) To SUVA.—Take the reverse of Route 656 (2). *Distance*, 4,519 miles.

(3) To APIA.—Take the reverse of Route 628 as far as Apia. *Distance*, 4,894 miles.

(4) To Tahiti.—Take the reverse of Route 628. *Distance*, 6,197 miles.

Route 705. **Hong Kong to Guam or Fanning island**

(1) To GUAM.—First steer for a position in lat. 21° 20′ N., long. 121° 00′ E., in Bashi channel, and thence take a Great Circle track direct to destination.

(2) To FANNING ISLAND.

(a) Direct route.—Take the reverse of Route 618.

(b) Via Guam.—Proceed to Guam as in (1) above, and thence as directly as navigation permits to Fanning island, passing northward of the Marshall islands.

Distance from Hong Kong to Guam, 1,800 miles; to Fanning island, via (2) (a), 5,121 miles; via (2) (b), 5,181 miles.

Route 706. **Hong Kong to Honolulu**

Take one of the following four routes. There is little difference in distance by taking (a) or (b). By (c) or (d), refuelling can be carried out at Guam or Yokohama, and the total distance is only about 290 miles or 130 miles longer respectively.

(a) Via Bashi channel.—First steer for a position in Bashi channel in lat. 21° 20′ N., long. 121° 00′ E., and then take a Great Circle track to lat. 26° 00′ N., long. 180° 00′. From this point steer on a Rhumb line track to Honolulu, passing southward of the chain of islands.

(b) Via Formosa strait.—After passing through the strait, steer round the north end of Formosa and thence take a Rhumb line track to a position in lat. 25° 50′ N., long. 127° 40′ E. From this point, follow the Great Circle track to a position in lat. 27° 10′ N., long. 177′ 45° W., about half way between Midway island and Bensaleux reef; thence proceed, southward of the chain of islands, as directly as possible to Honolulu.

(c) Via Guam.—Take Route 705 (1) to Guam, and thence the reverse of Route 608.

(d) Via Yokohama.—Take Route 707 (1) to Yokohama, and thence Route 743 (1) to Honolulu.

Distance from Hong Kong to Honolulu by (a), 4,849 miles; by (b), 4,833 miles; by (c), 5,130 miles; by (d), 4,973 miles.

Route 707. Hong Kong to Japanese ports

Proceed as directly as possible, keeping as close as prudent to the coast of China during the north-east monsoon until abreast of Tung yung island (*Lat. 26° 22′ N., Long. 120° 30′ E.*). Thence proceed as follows:—

(1) To YOKOHAMA.—Steer from the above point either to pass through Ōsumi kaikyō south of Kyūshū island, and thence direct to destination, or, if preferred, to pass between Tokara guntō and Amami guntō at about latitude 29 20° N., and thence to destination. There is practically no difference in distance, and the Kuro shio, or Japan stream, sets strongly to north-east on either route.

(2) To NAGASAKI.—Steer from the point off Tung yung island as directly as possible to destination.

(3) To HAKODATE.—First steer to pass through Korea strait or Tsushima kaikyō on either side of Tsushima and thence to destination.

Distance from Hong Kong to Yokohama, 1,584 miles; to Nagasaki, 1,066 miles; to Hakodate, 1,810 miles.

Route 708. Hong Kong to Shanghai and other ports on China and other coasts northward

(a) Usual route.—In all cases proceed as directly as navigation permits.

See Navigational Notes, Remarks, and Caution in Route 691, and, for other details regarding Navigation along this coast, China Sea Pilot, Vol. III., in which the route from Hong Kong to Shanghai is fully described.

Notes.—Care is necessary when navigating on this coast, as the tidal streams are very strong in places, especially in the vicinity of the Lamock islands, Amoy, Ockseu islands, Tung yung, the Tai chow lieh tao (Tai chau islands), the Chusan archipelago and the Yangtze kiang approach. At all times during the North-East Monsoon the weather is uncertain, and strong breezes set in without any warning, sometimes lasting two or three days or even more. Fog is experienced in the early part of the year.

(b) Low-powered vessels.—Vessels of small steam power should not attempt to proceed northward during the North-East Monsoon, nor during the typhoon season, except by the inshore passage. Good shelter during the north-east monsoon may be obtained at convenient distances along the coast. *See* China Sea Pilot, Vol. III.

Distances from Hong Kong are:—

To Amoy, 287 miles; to Chefoo, 1,215 miles; to Foochow, 462 miles; to Genzan kō (Won san chin), 1,429 miles; to Kiaochow, 1,100 miles; to Port Arthur (Ryojun kō), 1,256 miles; to Shanghai, 824 miles; to Taku (Hai ho entrance), 1,396 miles; to Vladivostok, 1,639 miles; to Weihaiwei, 1,178 miles.

Route 709. Hong Kong to Dutch harbour

Proceed via Yokohama or Hakodate.

(a) Via Yokohama.—Take Route 707 (1) to Yokohama, and thence take the Great Circle track to San Francisco (*see* Route 740 (a)) as far as lat. 44° 40′ N., long. 163° 40′ E. Thence proceed by Rhumb line tracks, first to lat. 49° 00′ N., long. 180° 00′, and thence to either Akutan or Unimak pass, according to weather conditions. Thence to Dutch harbour. *See* Bering Sea and Strait Pilot.

(b) Via Hakodate.—Take Route 707 (3) to Hakodate, and thence one of the two following routes.

(i) Take the Great Circle track to San Francisco (*see* Route 755 (a)) as far as the meridian of 180° 00′ in lat. 50° 25′ N. and thence proceed as directly as navigation permits to pass through Akutan or Unimak pass as in (a) above.

Alternatively, leave the Great Circle track at long. 175° 00′ E. and steer to Amchitka pass, and thence along the northward side of the islands to destination.

(ii) Take a Rhumb line track to lat. 49° 00′ N., long. 180° 00′, to join (a) above.

Distance from Hong Kong to Dutch harbour by (a), 4,219 miles, by (b) (i), 4,125 miles; by (b) (ii), 4,177 miles.

Route 710. Hong Kong to San Francisco or San Diego

Take passage by one of the following routes via Yokohama or Hakodate (the shortest route), making a call at Dutch harbour if necessary, or via Honolulu or via Guam and Honolulu.

(a) Via Yokohama.—Take Route 707 (1) to Yokohama, and thence take a Great Circle track to San Francisco or San Diego. *See* Route 740.

By calling at Dutch harbour (Route 709 (a)) the distance is increased by 154 miles to San Francisco, or to San Diego.

(b) Via Hakodate.—Take Route 707 (3) to Hakodate, and thence, having rounded Erimo misaki, a Great Circle track to destination. The vertex of the Great Circle to San Francisco is in lat. 50° 30′ N., long. 175° 00′ W., namely about 80 miles southward of the Aleutian islands. *See* also Route 755 (b) for alternative route.

By calling at Dutch harbour (Route 709 (b)) the distance is increased by 50 to 110 miles to San Francisco, or to San Diego, depending on the route taken from Hakodate.

(c) Via Honolulu direct.—Take Route 706 (a) or (b), and thence Route 601 to destination.

(d) Via Guam and Honolulu.—Take Route 705 (1) to Guam, and thence the reverse of Route 609 to Honolulu. Thence take Route 601 to destination.

Note.—A favourable current may be expected over most of the passage on (a) and (b); but on (c) and (d) the current is likely to be adverse across the ocean as far as Honolulu or beyond. On the other hand better weather will be experienced on the latter routes.

Distances from Hong Kong:

To San Francisco.—By (a), 6,120 miles; by (b), 6,020 miles; by (c), via Route 706 (b), 6,924 miles; by (d), 7,221 miles.

To San Diego.—By (a), 6,507 miles; by (b), 6,455 miles; by (c), via Route 706 (b), 7,108 miles; by (d), 7,405 miles.

Route 711. Hong Kong to Vancouver or Prince Rupert

(a) Via Hakodate (The most direct route).—Take Route 707 (3) to Hakodate and thence, after rounding Erimo misaki, take a Rhumb line to lat. 49° 00′ N., long. 180° 00′, and thence a second Rhumb line to Juan de Fuca strait, for Vancouver, or to Dixon entrance for Prince Rupert. *See also* (b) below.

(b) Via Yokohama.—Take Route 707 (1) to Yokohama, and thence Route 741 (a) as far as a position in lat. 44° 40′ N., long. 163° 40′ E., thence on a

Rhumb line to lat. 49° 00′ N., 180° 00′, and thence on a Rhumb line to either destination round the north point of Queen Charlotte islands to Prince Rupert, or by Juan de Fuca strait to Vancouver.

For route to Vancouver from Juan de Fuca strait, *see* Route 741, under which a Caution regarding currents and tidal streams, and notes on Fog, etc. will also be found.

Distance from Hong Kong to Vancouver by (a), 5,842 miles; by (b), 5,891 miles; to Prince Rupert by (a), 5,530 miles; by (b), 5,616 miles.

Route 712. **Hong Kong to Panama**

(a) Via Yokohama.—Take Route 707 (1) to Yokohama; thence take a Great Circle track to a position in lat. 22° 40′ N., long. 110° 00′ W., about 12 mlies southward of Cabo Falso. From this point proceed as directly as navigation permits south-eastward along the coast to Panama.

(b) Via Guam, Honolulu, San Diego.—Take Route 710 (d) to San Diego and thence proceed as directly as navigation permits to Panama, calling at Manzanillo for fuel (Diesel and fuel oil only) if necessary. There is little difference in distance by making this call.

This route is for vessels with a limited radius of action, the longest non-stop passage being 3,330 miles between Guam and Honolulu.

Distance from Hong Kong to Panama by (a), 9,264 miles; by (b), 10,244 miles.

Note.—By proceeding from Honolulu to Manzanillo direct (3,016 miles) the distance in (b) is shortened by nearly 400 miles.

Route 713. *Reserved as spare.*

Route 714. *Reserved as spare.*

(iv) ROUTES FROM MANILA

CAUTION.—In navigating the waters of the Philippines during the rainy season a sharp look-out must be kept for flotsam. Trees of immense size will be frequently met afloat. They have been found especially numerous on the south coast of Luzon; in one case, near Marinduque island, a group of them was adrift, still upright and resembling an island.

Route 715. **Manila to Thursday island and ports of Eastern Australia**

In both monsoons first take the reverse of Route 511 (a) to Thursday island, and thence take the Inner Route to destination. *See* Routes 444 (1) and 507 (a).

Distance from Manila to Thursday island, 2,195 miles; to Brisbane, 3,512 miles; to Sydney, 3,915 miles.

Note.—By proceeding via Route 511 (b) reversed, the distance to Sydney via Yap is 4,241 miles; via Guam it is 4,571 miles. *See also* Route 716.

Route 716. **Manila to Yap, Guam or Honolulu**

In each case proceed via Verde Island passage to San Bernardino strait, and thence take a Great Circle track direct to destination.

Distance from Manila to Yap 1,156 miles; to Guam, 1,497 miles; to Honolulu, 4,762 miles.

By calling at Guam on the passage to Honolulu the total distance is increased by only 65 miles.

Route 717. **Manila to Yokohama**

(a) Usual route.—After clearing Manila bay, steer as directly as possible for a position lat. 21° 20′ N., long. 121° 00′ E., southward of Formosa in the Bashi channel, and thence direct up the east coast of Formosa to a position lat. 26° 00′ N., long. 123° 00′ E. From this point steer to pass through the Nansei shotō, between Tokara guntō and Amami guntō at about lat. 29° 20′ N., and thence proceed direct to destination.

This route is in the full strength of the Kuro shio, or Japan current, from the south end of Formosa.

(b) Alternative route.—Another route, sixty miles shorter in distance, but much less favourable as regards current, is as follows. After leaving Manila steer up the coast of Luzon, and pass through the Balintang channel at its northern end. Thence proceed on a direct Rhumb line to destination.

Distance from Manila to Yokohama by (a), 1,815 miles; by (b), 1,756 miles.

Route 718. **Manila to North and Central American ports**

(1) TO SAN FRANCISCO OR SAN DIEGO. Take one of the following routes, direct, via Yokohama, or via Guam and Honolulu.

(a) Direct route.—Steer round the north of Luzon to a position in the Balintang channel in lat. 19° 45′ N., long. 122° 10′ E. From this point take the Great Circle track direct to either destination, passing to the southward of Hachijo shima in Nanpo shotō.

(b) Via Yokohama.—Take Route 717 to Yokohama and thence take Route 740 to destination.

(c) Via Guam and Honolulu.—Take Route 716 to Guam; thence Route 659 to Honolulu, and thence Route 601 to destination.

(2) TO VANCOUVER OR PRINCE RUPERT.

(a) Direct route.—Take (1) (a) above as far as lat. 41° 00′ N., long. 157° 00′ E.; thence take a Rhumb line track to lat. 49° 00′ N., long. 180° 00′ to join Route 741 (a).

(b) Via Yokohama.—Take Route 717 to Yokohama, and thence Route 741 to destination.

(c) Via Guam and Honolulu.—Take Route 716 to Guam; thence Route 659 to Honolulu, and thence Route 601 to destination.

(3) TO PANAMA.

(a) Via Yokohama.—Take Route 717 to Yokohama, and thence Route 744 to Panama.

(b) Via Guam and Honolulu.—Take Route 716 to Guam; thence Route 659 to Honolulu, and thence Route 602 to Panama.

Distances from Manila are as follows:—

To San Francisco by (1) (a), 6,218 miles; by (1) (b), 6,351 miles; by (1) (c), 6,918 miles.

To San Diego by (1) (a), 6,604 miles; by (1) (b), 6,738 miles; by (1) (c), 7,092 miles.

To Vancouver by (2) (a), 5,946 miles; by (2) (b), 6,159 miles; by (2) (c), 7,346 miles.

To Prince Rupert by (2) (a), 5,513 miles; by (2) (b), 5,847 miles; by (2) (c), 7,233 miles.

To Panama by (3) (a), 9,495 miles; by (3) (b), 9,510 miles.

Note.—By taking the direct route to Panama, passing north of Luzon the distance is 9,355 miles, only 140 miles less than via Yokohama, and 155 miles less than via Guam and Honolulu.

Route 719. **Manila to Shanghai**

(a) South-West Monsoon.—After passing Cape Bolinao, on west coast of Luzon, make a direct course to pass up the eastern side of Formosa. Round Hōka sho (Agincourt island) light on its eastern side, at a distance of 15 to 20 miles, and steer directly thence for Steep Island passage and the Whangpoo. *See also* (b) below for alternative route.

(b) North-East Monsoon.—From the position off Cape Bolinao steer to pass through the Pescadores channel, westward of Formosa, or between the Pescadores and Formosa banks arranging to be in either channel by daylight.

Otherwise steer for the Formosa strait, passing westward of Formosa banks and then keep as close to the coast of China as safe navigation permits (*See* Route 691 (2)); and pass through Steep Island passage to destination. This route may also be taken in the South-West Monsoon period.

Distance from Manila to Shanghai by (a), 1,128 miles; by (b), 1,150 miles (approx.).

Route 720. Manila to Hong Kong, Haiphong, Saigon or Bangkok

In each case proceed as directly as navigation permits. *See* Caution as to Pratas reef under Route 703 (1).

Distance from Manila to Hong Kong, 630 miles; to Haiphong (via Hainan strait), 930 miles; to Saigon, 905 miles; to Bangkok, 1,429 miles.

Route 721. Manila to Singapore

Take the reverse of Route 688 (1) (a) in both monsoons.

Distance from Manila to Singapore, 1,330 miles.

For routes onward from Singapore into the Indian ocean, see Section B, Part III, Chapter V.

Route 722. Manila to ports of Eastern archipelago and Southern Philippines

(1) To Soenda Straat and Djakarta (Batavia).—Proceed via Palawan passage (Route 687 (3) reversed), and via Stolze straat in Gaspar straten (*see* General directions in Eastern Archipelago Pilot, Vol. IV.).

(2) To Surabaya, Macassar, Balik Papan or Tarakan.—Proceed via Mindoro strait or Verde Island passage, according to monsoon, and thence across the Sulu sea to Sibutu passage and Macassar strait.

(3) To Sandakan, Sulu, Cebu (Sebu), and Iloilo.—Proceed via Mindoro strait or Verde Island passage, according to monsoon, and thence as directly as navigation permits through the Sulu sea to destination.

To Cebu and Iloilo, it is better to proceed by Verde Island passage and Hintotolo channel, during the North-East Monsoon; it is also the more direct route to Cebu.

Distances from Manila are as follows:—

To Balik Papan, 1,054 miles; to Djakarta, 1,562 miles; to Iloilo, 353 miles; to Macassar, 1,232 miles; to Sandakan, 574 miles; to Cebu, 392 miles; to Straat Soenda, 1,575 miles; to Sulu, 537 miles; to Surabaya, 1,497 miles; to Tarakan, 784 miles.

For routes onward from Straat Soenda into the Indian ocean, see Section B, Part III, Chapter V.

Route 723. *Reserved as spare.*

Route 724. *Reserved as spare.*

(v) ROUTES FROM SHANGHAI

Route 725. Shanghai to ports in Sea of Japan, Hwang Hai (or Yellow Sea) and Gulf of Pohai

Proceed as directly as navigation permits in all cases. If bound to Sea of Japan care should be taken to avoid the vicinity of Socotra rock (*Lat. 32° 07′ N., Long. 125° 11′ E.*). *See* Note below.

Distances from Shanghai are:—

To Chefoo, 514 miles; to Genzan (Won san chin), 781 miles; to Hakodate, 1,164 miles; to Kiaochow, 399 miles; to Nagasaki, 462 miles; to Port Arthur (Ryojun kō), 555 miles; to Sasebo, 464 miles; to Taku, 695 miles; to Weihaiwei, 477 miles.

Note.—Socotra rock is a coral patch over volcanic rock, which extends about a quarter of a mile north-east and south-west, and is about 60 yards wide, with a depth of probably less than 3 fathoms ($5^{m}5$) water. There are depths of 27 to 30 fathoms ($49^{m}4$ to $54^{m}9$) a quarter of a mile around the patch, excepting south-westward, where a rocky ledge, with a least depth of 17 fathoms ($31^{m}1$) extends half a mile. The rock is very steep on its southern and eastern sides.

The tidal streams set strongly over the patch, on which there are overfalls, and tide-rips; the sea sometimes breaks on the rock. Possibly, with a favourable light, the greenish colour of the water over the rock might be seen, but only from a very short distance.

A depth of 11 fathoms ($20^{m}1$) obtained by *S.S. Le Bruix*, lies 24 miles, 193° true, and a depth of 17 fathoms ($31^{m}1$) obtained by H.M.S. *Alacrity*, lies 26 miles, 151°, true, from Socotra rock. Soundings are scanty in the vicinity of these shoals.

Route 726. Shanghai to Yokohama

(a) Direct route.—Pass round the south end of Kyūshū through Ōsumi kaikyō, and thence proceed as directly as navigation permits to destination.

(b) Via Naikai (the Inland sea).—Proceed as directly as navigation permits: *See* Japan Pilot, Vol. I. for directions for the passage through Naikai.

Distance from Shanghai to Yokohama, by (a), 1,036 miles; by (b), 1,150 miles.

Route 727. Shanghai to Pacific islands

(1) To Honolulu.—Steer first to pass south of Japan by Ōsumi kaikyō, and cross the meridan of 140° E. at lat. 30° 10′ N., between Tori shima (*Lat. 30° 28′ N., Long. 140° 18′ E.*), and Sōfu gan (Lot's Wife) (*Lat. 29° 46′ N., Long. 140° 20′ E.*). Take a Great Circle track thence to Midway island (*Lat. 28° 13′ N., Long. 177° 21′ W.*), and pass along the northern side of the chain of islands between it and Honolulu.

(2) To Guam.—Take the reverse of Route 666.

(3) To Yap.—Take the reverse of Route 676.

(4) To Suva.—Take the reverse of Route 656 (1).

(5) To Apia and Tahiti.—Take the reverse of Route 627 (Via Guam).

Distance from Shanghai to Honolulu, 4,322 miles; to Guam, 1,684 miles; to Yap, 1,636 miles; to Suva, 4,479 miles; to Apia, 4,869 miles; to Tahiti, 6,172 miles.

Route 728. Shanghai to San Francisco or San Diego

(a) Via Hakodate.—Take Route 725 to Hakodate, and thence proceed as in Route 755 (a). This is the most direct route. *See* also Route 755 (b) for alternative route.

(b) Via Yokohama.—Take Route 726 to Yokohama and thence proceed as in Route 740.

Distance from Shanghai to San Francisco by (a), 5,414 miles; by (b), 5,572 miles; to San Diego, by (a), 5,809 miles; by (b), 5,959 miles.

By calling at Dutch harbour (*see* Routes 756 and 739) for fuel the route is divided up into shorter unbroken passages. For increase of distance *see* Route 756 from Hakodate or Route 739 from Yokohama.

See Route 729 for details of a southern route via Honolulu, or via Guam and Honolulu. The total distance is 305 miles less to San Francisco or 121 miles less to San Diego than those given for Prince Rupert.

Route 729. Shanghai to Prince Rupert or Vancouver

Proceed via Hakodate or Yokohama, making a call at Dutch harbour if necessary for fuel.

(a) Via Hakodate.—Take Route 725 to Hakodate and thence proceed by Route 757 to either destination.

(b) Via Yokohama.—Take Route 726 to Yokohama and thence proceed by Route 741 to either destination.

Distance from Shanghai to Prince Rupert by (a), 4,884 miles; by (b), 5,068 miles; to Vancouver by (a), 5,196 miles; by (b), 5,380 miles.

By calling at Dutch harbour the route is divided up into shorter unbroken passages. For details *see* Route 756 and 757 from Hakodate, or Route 740 and 741 from Yokohama.

Note.—A vessel wishing to proceed by a more southerly route may take passage via Honolulu; or via Guam and Honolulu, if radius of action is limited. The total distance is 6,718 miles to Prince Rupert and 6,741 miles to Vancouver via Honolulu; via Guam and Honolulu, the total distance is 7,410 miles to Prince Rupert, and 7,433 miles to Vancouver, but the longest unbroken passage is only 3,330 miles from Guam to Honolulu. *See* Routes 727 (1), 727 (2), 659, and 601.

Route 730. Shanghai to Panama

(a) Via Hakodate.—This it the most direct route. Take Route 725 to Hakodate and thence Route 759 (a) to Panama.

Note.—This route necessitates a radius of action of at least 7,500 miles (*see* Route 759); but a call at San Francisco or San Diego (Route 755) only lengthens the total distance by about 80 and 60 miles respectively.

(b) Via Yokohama, Honolulu, and San Diego or Manzanillo.—Take Route 726 to Yokohama and thence Route 743 (1) to Honolulu. From Honolulu take Route 601 to San Diego or Route 602 to Manzanillo, in either case proceeding onward to destination as directly as navigation permits.

Note.—The above route is for a vessel with an ordinary radius of action. At Manzanillo only diesel and fuel oil (but no coal) can be obtained; at San Diego coal can be obtained by previous arrangement, but fuel and diesel oil are available in any quantity.

Distance from Shanghai to Panama by (a), 8,582 miles; by (b), via San Diego, 9,539 miles; via Manzanillo, 9,150 miles.

Route 731. Shanghai to Wellington

Take the reverse of Route 585 (a), (b), or (c), via Yap, Guam, or Thursday island.

Distance from Shanghai to Wellington by 585 (a), 5,417 miles.

Routes 732. Shanghai to Brisbane

Take the reverse of Route 537 which proceeds via Yap, via Guam, or via Thursday island.

Distance from Shanghai to Brisbane via Yap, 4,221 miles; via Guam, 4,325 miles; via Thursday island, 4,329 miles.

Route 733. Shanghai to Sydney

Take one of the three following routes.

(a) Via Yap, or Guam.—Take the reverse of Route 513 (b) (i) or (ii).

(b) Via Manila and Thursday island.—Take the reverse of Route 719 (a) or (b), according to season, to Manila and thence take Route 715 to Sydney.

(c) Via Hong Kong and Thursday island.—Take the reverse of Route 708 to Hong Kong and thence take Route 701 (2) (a) to Sydney.

Distance from Shanghai to Sydney by (a), via Yap, 4,721 miles; by (a), via Guam, 4,758 miles; by (b), 5,043 miles; by (c), 5,273 miles.

Notes.—By route (b) above a strong contrary current will be experienced as far as the Philippines, whether the passage is made eastward or westward of Formosa; the latter is 22 miles longer than that given in the distance above.

A call at Manila between Hong Kong and Thursday island when taking route (c) will add 100 miles to the whole distance to Sydney. *(See* Routes 708, 703 (1) and (b) above).

Route 734. Shanghai to Hong Kong or Manila

(1) To HONG KONG.—Take the reverse of Route 708.

(2) To MANILA.

(a) Direct.—Take the reverse of Route 719 (a) or (b), according to season.

(b) Via Hong Kong.—Take the reverse of Route 708 to Hong Kong, and thence Route 703 (1) to Manila.

Distance from Shanghai to Hong Kong, 824 miles; to Manila by (2) (a), 1,128 miles; by 2 (b), 1,474 miles.

Note.—A strong contrary current will be experienced on 2 (a) above for the greater part of the voyage. Except during the South-West Monsoon the unfavourable current will be felt over a smaller part of the passage in 2 (b), while a favourable current may be experienced over part of the route.

Route 735. Shanghai to Tongking gulf, Saigon or Bangkok

(1) To HAIPHONG.—Proceed as directly as navigation permits, passing either through Hainan strait or southward of Hainan island; the latter is 117 miles longer.

(2) To SAIGON or BANGKOK.

(a) Usual route.—Proceed through Formosa strait and between Paracel islands and Macclesfield bank, and thence to destination as directly as navigation permits.

(b) May to August.—If the South-West Monsoon is strong, an alternative route is to proceed westward of the Paracel islands, and along the coast of Annam to Saigon, and as directly as safe navigation permits to Bangkok. This route is about 30 to 40 miles longer than (2) (a).

Distance from Shanghai to Haiphong via Hainan strait, 1,283 miles; to Saigon by 2 (a), 1,687 miles; to Bangkok by 2 (a), 2,220 miles.

Route 736. Shanghai to Singapore

(a) Usual Route.—Proceed by Formosa strait and by Main Route of the China sea (*see* Route 687 (1)) between Macclesfield bank and the Paracel islands.

(b) May to August.—If the South-West Monsoon is strong, an alternative route is to pass westward of the Paracel islands, and thence along the coast of Annam and Cochin China from Cape Varella. This increases the distance by about 40 miles.

See Route 698, Hong Kong to Singapore.

Distance from Shanghai to Singapore by (a), 2,187 miles.

Route 737. *Reserved as spare.*

Route 738. *Reserved as spare.*

(vi) ROUTES FROM YOKOHAMA

Route 739. Yokohama to Dutch harbour

(a) South of the Aleutian islands.—Take the Great Circle track to San Francisco (*see* Route 740 (a)) as far as lat. 44° 40′ N., long. 163° 40′ E. Thence proceed by Rhumb line tracks, first to lat. 49° 00 ′N., long. 180° 00′, and thence to Akutan or Unimak pass, according to weather conditions. *See* Bering Sea and Strait Pilot.

(b) North of the Aleutians.—Take a Great Circle track to a position in lat. 51° 06′ N., long. 179° 30′ E., about 20 miles southward of the eastern end of Amchitka island; thence pass through Amchitka pass, and steer along the northward side of the Aleutians as directly as navigation permits to destination.

Distance from Yokohama to Dutch harbour by (a), 2,635 miles; by (b), 2,515 miles.

Route 740. Yokohama to San Francisco or San Diego

(a) Direct route.—Take the Great Circle track direct to either destination. The vertex of the Great Circle to San Francisco is in lat. 47° 30′ N., long. 167° 00′ W., passing through lat. 44° 40′ N., long. 163° 40′ E. (*See* Route 739 (a)).

(b) Via Dutch harbour.—Take Route 739 to Dutch harbour and thence Route 766 to either destination. Fuel of all kinds is obtainable at Dutch harbour, and the longest unbroken passage is only 2,635 miles.

(c) Alternative route.—To avoid bad weather the reverse of Route 793 (c) can be taken, but the distance is about 300 miles greater than in (a) above.

Distance from Yokohama to San Francisco by (a), 4,536 miles; by (b), 4,690 miles; to San Diego, by (a), 4,923 miles; by (b), 5,077 miles.

Note.—Fogs.—These are of frequent occurrence on the coast of California, and prevail almost uninterruptedly during the summer months; and often as late as to the middle of October.

See also first paragraph under "Fogs," Route 741 and 786.

Route 741. Yokohama to Prince Rupert or Vancouver

(a) Usual route.—All seasons.—After clearing Nojima saki, the most southerly point to the eastward, after leaving Uraga suidō, take the Great Circle track to San Francisco (*see* Route 740) as far as lat. 44° 40′ N., long. 163° 40′ E., which passes through long. 150° 00′ E. at lat. 39° 40′ N. and long. 160° 00′ E. at lat. 43° 35′ N.

From the point at long. 163° 40′ E., steer on a Rhumb line to a position lat. 49° 00′ N., long. 180° 00′, and thence on Rhumb lines to either destination. Pass around the north point of Queen Charlotte islands, by Dixon entrance and Brown passage to Prince Rupert; or to Juan de Fuca strait for Vancouver.

(b) Via Dutch harbour.—Take Route 739 to Dutch harbour and thence Route 765 to either destination. *See* Note regarding fuel in Route 740 (b) above.

Navigational Notes.—Route (a) above is usually in a warm easterly current throughout. A strong N.W. set is often felt across the entrance to Juan de Fuca strait, and should be carefully guarded against.

The best route for deep draught vessels from Juan de Fuca strait to Burrard inlet (Vancouver city) is south of Trial and Discovery islands, through the main channel of Haro strait, and northward of Stuart and Skipjack islands; thence through Boundary pass westward of Patos island, into the Strait of Georgia.

The usual route for moderate-sized vessels to Burrard inlet is south of Trial island, thence by the inshore channels, Mayor and Baynes, passing westward of Chain and Chatham islands; thence to the northward, passing eastward of Zero rock, and between Darcy shoals and Darcy island, through Sidney channel and Moresby passage, thence through Swanson channel, between Pender and Prevost islands, and thence through Active pass into the Strait of Georgia; it is shown by a pecked line on chart 2689. By using this route weaker tidal streams will be experienced than are found in Haro strait route.

Distance from Yokohama to Prince Rupert by (a), 4,032 miles; by (b), 3,907 miles; to Vancouver by (a), 4,344 miles; by (b), 4,274 miles, via Queen Charlotte strait, or 4,360 miles via Juan de Fuca strait.

CAUTION. — *Currents and Tidal Streams.* — *See* British Columbia Pilot, Vols. I and II, in which considerable information is given regarding the set of the currents and tidal streams on this broken coast with many outlying dangers.

Inner passages.—When navigating the inner waters of British Columbia, it should be constantly borne in mind that many of the minor passages have only been roughly examined; detached boulders from the broken shores and pinnacles of rock are still frequently found. Whenever, therefore, a broad and clear channel which has been surveyed is known to exist, there is no justification in using, without necessity, one of more doubtful character, even if there be come saving in distance; and a vessel should always be maintained in the safest possible position in a channel, as well as when going in or out of port. *See also* Route 785.

Kelp.—Kelp is visible on the surface of the water during the summer and autumn months, growing on nearly every danger with a bottom of rock or stones, especially in those channels where the water is in constant motion; but during the winter and spring this useful marine plant is not always visible, and in British Columbian waters in close harbours where there is little motion in the water it is often absent.

It should be the invariable rule never to pass over kelp. In general, by keeping clear of kelp danger is avoided, but this must not prevent attention to sounding, as the rule sometimes fails; kelp is always a sign of danger, and unless the spot where it grows has been carefully sounded, it is not safe for a vessel to pass through it. A heavy surge will occasionally tear the kelp away from rocks, and a moderate stream will cause it to submerge. When passing on that side of a patch of kelp from which the stems stream away with the current, care should be taken to give it a wide berth, because the kelp showing under such conditions is on one side of and not over the rocks. The least depth will usually be found in a clear spot in the middle of a thick patch of fixed kelp.

It is perhaps well to point out that kelp, not attached to rocks, floats on the water in heaps, whereas kelp, attached to rock, streams away on the surface and the leaves give an occasional flap.

Fogs.—Summer fogs prevail upon the coast from June to September, and in some seasons they are almost continuous, and very dense. They extend along the seaboard from Alaska, and at times reach as far south as Cape San Lucas. They frequent stretch several hundred miles seaward, and appear to be associated with the Kuro shio (Japan) current. At times they appear local, and exist in the vicinity of the great wind-gaps along the coast, whilst the prominent headlands and coast peaks are free.

In Juan de Fuca strait, the fogs are heaviest near the entrance, and decrease in frequency and density up the strait. Sometimes the fog stands before the entrance like a wall, and vessels entering run from it into bright, clear weather, even before they pass Tatoosh island. As a rule, it may be said that the fog is more likely to follow farther into the strait along the southern shore, reaching as far as Port Townsend, when the northern side of this wide part is free.

During the prevalence of these fogs, the wind is moderate or calm, and the weather becomes mild and pleasant, with gentle breezes; or strong north-west winds may come up, and drive away the fog, bringing clear skies, and the regular north-west swell of the Pacific. In winter, the fogs are replaced by the thick murky weather of the south-easters, which bring up rain and squalls, but through which headlands can be made out at a distance of several miles. Fog occurs in winter, but they are exceptional, and do not last long.

Smokes from forest fires cause much inconvenience during the dry season, July, August, and September, and are a great impediment to navigation. In some seasons they have extended from the Strait of Georgia to Portland inlet. In recent years their prevalence has considerably diminished, some seasons being almost entirely clear of them; they are cleared away by rains.

Route 742. Yokohama to Columbia river (Astoria)

Take the Great Circle track towards San Francisco as in Route 740, as far as the 180th meridian passing through long. 170° 00′ E. at lat. 45° 45′ N., and 180° 00′ at lat. 47° 00′ N.

From this point steer to pick up the track to Vancouver (Route 741) at a position lat. 49° 00′ N., and long. 167° 00′ W. Leave the Vancouver track at a position lat. 49° 00′ N., long. 137° 00′ W., and steer as directly as navigation permits to destination.

Distance from Yokohama to Astoria, 4,277 miles.

See Remarks on Fogs under Route 740, 741 and 786.

Route 743. Yokohama to Pacific islands

(1) To Honolulu.—Take the direct Great Circle track. The highest latitude reached is 35° 00′ N., between longitudes 144° 00′ and 149° 00′ W. The track crosses the meridian of 180° at lat. 30° 15′ N., long. 175° 00′ W., at lat. 27° 00′ W., and thus passes at about 60 miles northward of the chain of islands and reefs between Ocean island (*Lat. 28° 25′ N., Long. 178° 30′ W.*) and Honolulu.

See also Route 607 (a) for an alternative route.

(2) To Tahiti.—Take the direct Great Circle track which passes clear of all dangers between the two ports. It cuts the meridian of 165° E. at lat. 21° 00′ N. and 170° E. at lat. 17° 25′ N., thus passing 30 miles north-eastward of Wake island (15 feet high, *see* Pacific Islands Pilot, Vol. II).

The track crosses the equator at long. 170° 00′ W. and passes midway between Penrhyn island and Rakahanga, at a distance of about 80 miles from the former, direct to destination.

(3) To Apia.—The Great Circle track may be taken as far as long. 160° 00′ E. passing 20 miles westward of Minami Tori shima (Marcus island) (*Lat. 24° 14′ N., Long. 154° 00′ E.*), and cutting long. 150° 00′ E. at lat. 27° 25′ N., long. 155° 00′ E., at lat. 23° 00′ N.; and long. 150° 00′ E. at lat. 18° 00′ N.

From the latter point steer between Eniwetok and Providence atoll, 120 miles to the south-westward; and thence westward of the Marshall islands and Gilbert islands, passing between the Gilbert and Ellice islands group to destination, crossing the equator at long. 172° 00′ E. (*see* Pacific Islands Pilot, Vol. II).

Note.—The direct Great Circle track leads through the midst of the Marshall islands and Gilbert islands groups, and though navigable, is not advisable to be undertaken in the existing state of hydrographic knowledge concerning these waters, and the extreme uncertainty of the currents. It is only 60 miles shorter than the above track.

(4) To Suva.—Take the Great Circle track which leads clear of all dangers and passes about 30 miles westward of Kusaie (2,155 feet high) in lat. 5° 22′ N., long. 162° 56′ E., and directly thence to the Kandavu passage leading to Suva.

(5) To Guam.—Pass between Kazan rettō and Ogasawara guntō and thence proceed by Rhumb line direct.

(6) To Yap.—Take a Rhumb line track direct.

Distance from Yokohama to Honolulu, 3,389 miles; to Tahiti, 5,139 miles; to Apia, 4,122 miles; to Suva, 3,942 miles; to Guam, 1,353 miles; to Yap, 1,568 miles.

Route 744. Yokohama to Panama

(a) Direct route.—Take a Great Circle track to a position in lat. 22° 40′ N., long. 110° 00′ W., about 12 miles southward of Cabo Falso, and thence proceed as directly as navigation permits south-eastward along the coast to Panama.

The distance by this route (7,680 miles) is beyond the radius of action of many vessels; these may take one of the following alternatives:—

(b) Via San Diego.—Take Route 740 (a), (b) or (c), to San Diego, and thence proceed southward along the coast as directly as navigation permits to Panama. *See* Noye under (c) (ii) below.

Note.—A call at Dutch harbour for fuel adds about 140 miles to the total distance.

(c) Via Honolulu direct, or via Honolulu and San Diego, or Honolulu and Manzanillo.—These routes are for vessels who may wish to take a more southerly route and have a limited bunker capacity.

(i) Via Honolulu direct.—Take Route 743 (1) to Honolulu and thence take Route 602 to Panama.

(ii) Via Honolulu and San Diego.—Take Route 743 (1) to Honolulu and thence take Route 601 to San Diego. Thence proceed southward along the coast as directly as navigation permits to Panama.

Note.—Fuel and diesel oil, but no coal, is available at San Diego; the latter may be obtained by previous arrangement, or a vessel may call at Los Angeles about 90 miles to the northward.

(iii) Via Honolulu and Manzanillo.—Take Route 743 (1) to Honolulu, and thence Route 602 to Manzanillo. Thence proceed southward as directly as navigation permits to Panama.

Note.—Only fuel and diesel oil is available at Manzanillo.

Distance from Yokohama to Panama by (a), 7,680 miles; by (b), 7,762 miles; by (c) (i), 8,072 miles; by (c) (ii), 8,503 miles; by (c) (iii), 8,124 miles.

Route 745. Yokohama to Wellington

Take the reverse of Route 586.

Distance from Yokohama to Wellington, 5,075 miles.

Route 746. Yokohama to Sydney

Take the reverse of Route 514 (a).

Distance from Yokohama to Sydney, 4,379 miles.

Route 747. Yokohama to Brisbane

Take the reverse of Route 538 (via Bougainville strait).

Distance from Yokohama to Brisbane, 3,980 miles.

Route 748. Yokohama to Thursday island

(a) Via Djailolo passage and Eastern archipelago.—Take the reverse of Route 564 (a).

(b) Via Bougainville strait.—Take the reverse of Route 564 (b).

Distance from Yokohama to Thursday island by (a), 3,240 miles; by (b), 3,707 miles.

Route 749. Yokohama to Manila

Take the reverse of Route 717 (b) via Balintang channel.

Distance from Yokohama to Manila, 1,756 miles.

Route 750. Yokohama to Singapore

Take the reverse of Route 692 (2) (a) via Balintang channel.

Distance from Yokohama to Singapore, 2,888 miles.

Route 751. Yokohama to Hong Kong

Keep as close as safe navigation permits to the south coast of Japan, to avoid the strength of the Kuro shio current. Pass through Ōsumi kaikyō and thence direct to destination through the Formosa strait.

CAUTION.—There is often a strong indraught into the deep bays on the south coast of Japan, especially between Ō shima and Mikomoto shima, with easterly winds, and during the typhoon months the currents in this locality are subject to great irregularity.

Distance from Yokohama to Hong Kong, 1,584 miles.

Route 752. Yokohama to Shanghai, Kiaochow and ports in Gulf of Pohai

(1) To SHANGHAI.

(a) Southern route.—Pass through Ōsumi kaikyō as in Route 751, and thence proceed to destination as directly as navigation permits.

(b) Via Naikai (Inland sea).—Steer along the south coast of Japan as in Route 751 and enter Naikai (Inland sea) by Kii suidō and pass through Naikai to Shimonoseki kaikyō (for directions *see* Japan Pilot, Vol. II); thence proceed as directly as navigation permits to destination.

(2) To KIAOCHOW, and ports in GULF OF POHAI.—There are two routes, one northward of Quelpart island (Saishū tō), and one to the southward. That to the northward would be the shorter, if coming from Shimonoseki and the Naikai (Inland sea); that to the southward, from Yokohama via Ōsumi kaikyō, southward of Japan, though longer, has easier navigation.

(a) Via Naikai (Inland sea) and north of Quelpart island (Saishu tō).—This route should only be taken in clear weather.

First pass through the Naikai (Inland sea) via Kii suidō and Shimonoseki kaikyō as in (1) (b) above, and thence steer to pass 3 miles south-westward of Ninepin rock (Zetsumei sho) (*Lat. 33° 52′ N., Long. 126° 18′ E.*), 159 feet (48^{m}5) high, and thence to pass 5 miles south-westward of Chiku tō (Chu dō) lighthouse (*Lat. 34° 13′ N., Long. 125° 51′ E.*) and of Byōbu (Hempun) tō, near it.

From this point steer to pass about 1½ miles south-westward of Ben sho (Venancourt rock), 133 feet (40^{m}5) high, steep-to (*Lat. 34° 32′ N., Long. 125° 21′ E.*) and 4 miles westward of Ko tō (1,188 feet (362^{m}1) high) near it. From this point steer across Hwang hai (Yellow sea) to clear Alceste island northward of the Shantung promontory, and thence as directly as navigation permits to destination.

(b) Via Ōsumi kaikyō and south of Quelpart island (Saishu tō).—Proceed as in Route 751 to Ōsumi kaikyō, and thence steer to pass at a safe distance southward of Uji gunto (*Lat. 31° 10′ N., Long. 129° 25′ E.*) (*see* Japan Pilot, Vol. II.), and thence south-westward of Quelpart island (Saishu tō), giving it a wide berth at night or, except in clear weather, by day, to avoid Kafudan (Samarang rocks), and Kapa tō (Barlow) and Mara tō, which are low and flat.

Thence steer to pass 10 miles westward of Shō Kokuzan (Ross island) tō (*Lat. 34° 04′ N., Long. 125° 10′ E.*), the south-western island of the Korean archipélago, and thence across Hwang hai (Yellow sea) to clear Alceste island, northward of the Shantung, and thence as directly as navigation permits to destination.

CAUTION. On both the above routes observe that off the south-west coast of Korea, the current, though not usually of great strength, is very variable, being largely dependent on the wind, and sometimes attains a rate of from 30 to 50 miles a day. In the inner route the tidal streams must also be considered, as they are rapid. Fog frequently occurs on the west coast of Korea from March to July, and on the south coast from April to August.

Distance from Yokohama to Shanghai by (1) (a), 1,036 miles; by (1) (b), 1,150 miles.

The following is the distance from Yokohama to ports via (2) (a). The distances via (2) (b) are all about 130 miles greater.

To Chefoo, 1,133 miles; to Kiaochow, 1,122 miles; to Port Arthur (Ryojun kō), 1,174 miles; to Taku (Hai ho entrance), 1,314 miles; to Weihaiwei, 1,096 miles.

Route 753. *Reserved as spare.*

Route 754. *Reserved as spare.*

(vii) ROUTES FROM HAKODATE

Route 755. Hakodate to San Francisco or San Diego

Passage can be made by the direct Great Circle track or by a more southerly track whose most northerly point is lat. 47° 30′ N., long. 167° 00′ W. By the latter route a favourable current may be expected; this is doubtful on the direct route.

(a) Direct route.—Having rounded Erimo misaki, take a Great Circle track to either destination, bearing away to the southward when nearing the American coast, so as to round Point Conception, if bound to San Diego. The vertex of the Great Circle to San Francisco is in lat. 50° 51′ N., long. 173° 44′ W., namely about 80 miles southward of the Aleutian islands.

(b) Southern route.—Having passed Erimo misaki take a Great Circle or Rhumb line track (there is only 14 miles difference) to a position in lat. 47° 00′ N., long. 180° 00′ (for San Francisco), or in lat. 46° 15′ N., long. 180° 00′ (for San Diego); from thence:—

(i) To San Francisco.—Take a Great Circle track direct. This is the Yokohama to San Francisco track in Route 740 (a).

(ii) To San Diego.—Take a Great Circle track to a position in lat. 34° 15′ N., long. 120° 28′ W., south of Point Conception, and thence proceed to destination as directly as navigation permits.

Distance from Hakodate to San Francisco by (a), 4,250 miles; by (b), 4,293 miles; to San Diego, by (a), 4,645 miles; by (b), 4,678 miles.

Route 756. Hakodate to Dutch harbour

Proceed as directly as navigation permits, passing northward or southward of the Aleutian islands. The latter may also be taken by proceeding by Rhumb line track to lat. 49° 00′ N., long. 180° 00′ to join Route 739 (a); this will enable a vessel to keep in a favourable current as long as possible.

Distance from Hakodate to Dutch harbour by direct route, passing northward of the Aleutians, 2,228 miles; passing southward of the islands, 2,313 miles.

On the alternative route via lat. 49° 00′ N., long. 180° 00′, the distance is 2,367 miles.

Route 757. Hakodate to Prince Rupert or Vancouver

(a) Direct route.—Take a Rhumb line track to a position in lat. 49° 00′ N., long. 180° 00′ to join Route 741 (a).

(b) Via Dutch harbour.—Take Route 756 to Dutch harbour, and thence Route 765 to destination.

Distance from Hakodate to Prince Rupert by (a), 4,720 miles; to Vancouver by (a), 3,985 miles.

See Navigational Notes and Cautions under Route 741.

Route 758. Hakodate to Honolulu

Take the Great Circle track direct, passing north of Kauai.

Distance from Hakodate to Honolulu, 3,310 miles.

Route 759. Hakodate to Panama

Proceed either direct, via San Diego, or via Honolulu.

(a) Direct route.—Take a Great Circle track to lat. 28° 40′ N., long. 118° 20′ W., southward of Isla Guadalupe, and proceed thence as direct as navigation permits to destination.

(b) Via San Diego.—Take Route 755 (a) or (b) to San Diego, and proceed thence as directly as navigation permits to Panama.

(c) Via Honolulu.—Take Route 758 to Honolulu and thence take Route 602 to Panama. *See* Note and Caution regarding the variations of Route 602 under that route.

Distance from Hakodate to Panama by (a), 7,418 miles; by (b) and 755 (a), 7,484 miles; by (b) and 755 (b), 7,517 miles; by (c), 7,993 miles.

Route 760. *Reserved as spare.*

Route 761. *Reserved as spare.*

See Section D. Part III. Index on pages 357 and 358.

SECTION B. PART IV.

Chapter IV

ROUTES FROM PORTS ON THE EASTERN SIDE OF PACIFIC OCEAN

(i) ROUTES FROM DUTCH HARBOUR

CAUTION.—Great attention must be paid to the currents in and around the Aleutian islands *See* Bering Sea and Strait Pilot.

Route 762. Dutch harbour to Hakodate or Yokohama

Steer along the southern side of the Aleutian islands as directly as navigation permits to a position in lat. 50° 30′ N., long. 180° 00′ to join Route 769 (1) Prince Rupert to Hakodate, or Route 770, Prince Rupert to Yokohama.

Distance from Dutch harbour to Hakodate, 2,313 miles; to Yokohama, 2,616 miles.

Route 763. Dutch harbour to ports in China or to Singapore

(a) Via Hakodate.—Take Route 762 to Hakodate, and thence proceed as directly as navigation permits through Korea strait to destination.

(b) Via Guam.—After clearing Akutan pass, take a Great Circle track direct to Guam, and thence take Route 666 to Shanghai, Route 667 to Hong Kong or Route 668 (2) to Singapore.

Note.—The above route (b) is designed to avoid the bad weather to be expected in winter on route (a), and much of the adverse current. To Guam, the current will be across the track from west to east for a large part of the passage, while a favourable current may be expected onwards from Guam (except in the China sea in June, July, and August when bound to Singapore). The total distance by (b) is 570 miles greater to Singapore, and over 1,060 greater to Hong Kong.

Distance from Dutch harbour to Shanghai by (a), 3,462 miles; to Hong Kong by (a), 4,123 miles; by (b), 5,188 miles; to Singapore by (a), 5,486 miles; by (b), 6,055 miles.

Distance from Dutch harbour to Guam, 3,388 miles.

Route 764. Dutch harbour to Honolulu

Proceed by Great Circle, or Rhumb line track direct after clearing Akutan pass.

Distance from Dutch harbour to Honolulu, 2,035 miles.

Route 765. Dutch harbour to Prince Rupert or Vancouver

Proceed as directly as navigation permits to either destination.

Distance from Dutch harbour to Prince Rupert, 1,272 miles; to Vancouver by Queen Charlotte strait, 1,639 miles; by Juan de Fuca strait, 1,725 miles.

Route 766. Dutch harbour to San Francisco or San Diego

Having cleared Akutan pass, take a Great Circle track direct to either destination.

Distance from Dutch harbour to San Francisco, 2,055 miles; to San Diego, 2,442 miles.

Route 767. Dutch harbour to North and Central American ports south of San Diego

After clearing Akutan pass, take a Great Circle track to a position in lat. 28° 00′ N., long. 116° 00′ W., south-westward of Islas San Benito, and from thence proceed southward as directly as navigation permits to destination.

Distance from Dutch harbour to Manzanillo, 3,536 miles; to Panama, 5,254 miles.

Route 768.—*Reserved as spare.*

(ii) ROUTES FROM PRINCE RUPERT

Route 769. Prince Rupert to Hakodate and to ports in China or to Singapore

(1) To HAKODATE.—At all seasons of the year the route is the same as far as the 180th meridian, as follows:—

Cross the meridian	135° 00′ W.	at lat.	54° 40′ N.
„ „ „	140° 00′ W.	„	54° 50′ N.
„ „ „	145° 00′ W.	„	54° 50′ N.
„ „ „	150° 00′ W.	„	54° 30′ N.
„ „ „	155° 00′ W.	„	54° 10′ N.
„ „ „	160° 00′ W.	„	53° 40′ N.
„ „ „	165° 00′ W.	„	53° 00′ N.
„ „ „	170° 00′ W.	„	52° 15′ N.
„ „ „	175° 00′ W.	„	51° 30′ N.
„ „ „	180° 00′	„	50° 30′ N.

The track passes about 30′ southward of the Aleutian island chain, and is in the west-going current. From the 180th Meridian there is a winter track and a summer track, as follows:—

(a) November 1st to March 31st.

Cross the meridian	175° 00′ E.	at lat.	50° 30′ N.
„ „ „	170° 00′ E.	„	50° 10′ N.
„ „ „	165° 00′ E.	„	49° 30′ N.
„ „ „	160° 00′ E.	„	48° 20′ N.
„ „ „	155° 00′ E.	„	46° 30′ N.
„ „ „	150° 00′ E.	„	44° 00′ N.

From this point the track is as direct as navigation permits to Hakodate.

(b) April 1st to October 31st.

Cross the meridian	175° 00′ E.	at lat.	50° 00′ N.
„ „ „	170° 00′ E.	„	49° 15′ N.
„ „ „	165° 00′ E.	„	48° 20′ N.
„ „ „	160° 00′ E.	„	47° 10′ N.
„ „ „	155° 00′ E.	„	45° 20′ N.
„ „ „	152° 00′ E.	„	44° 00′ N.

From the 152nd meridian E. the track is as direct as navigation permits to Tsugaru kaikyō and to Hakodate.

(2) To PORTS IN CHINA, or to SINGAPORE.

(a) Via Hakodate.—Take Route (1) (a) or (b) above to Hakodate, and thence proceed southward as directly as navigation permits, through Korea strait to destination.

(b) Altermative track (to China ports from Shanghai southward).—Take a Great Circle track to lat. 30° 00′ N. on the 180th meridian, and thence take a second Great Circle track to a position in lat. 28° 40′ N., long. 129° 00′ E., passing through Nanpō shotō northward of Tori shima, and through Nansei shotō between Tokara guntō and Amami guntō. From the above point proceed as directly as navigation permits to destination.

See Section D. Part III. Index on pages 357 and 358.

Note.—This route, although some 850 to 950 miles longer than that in (2) (a), avoids to a great extent the adverse current and bad winter weather of the more northerly routes.

Only vessels with a considerable radius of action can use this route.

(c) Via Guam (to ports from Hong Kong southward).—Take a Great Circle track to Guam, and thence take Route 667 to Hong Kong or Route 668 (2) to Singapore.

Note.—This route, which avoids the worst of the adverse current and winter bad weather, enables re-fuelling to be carried out at Guam. From Guam a favourable current will be carried, except during June, July, and August, when it will be adverse in the China sea.

The total distance by (2) (c) is only 216 miles longer to Hong Kong than by (2) (b), and 557 miles longer to Singapore than by (2) (a); it is, however, 242 miles less to the latter than by (2) (b).

Distance from Prince Rupert to Hakodate by (1) (a) or (1) (b), 3,525 miles; to Shanghai by 2 (a), 4,674 miles; by (2) (b), 5,621 miles; to Hong Kong by (2) (a), 5,335 miles; by (2) (b), 6,172 miles; by (2) (c), 6,388 miles; to Singapore by (2) (a), 6,698 miles; by (2) (b), 7,497 miles; by (2) (c), 7,255 miles.

The distance from Prince Rupert to the position on the 180th meridian in (1) is 1,795 miles; to 180th meridian in 2 (b) it is 2,577 miles.

Distance from Prince Rupert to Guam by (2) (c), 4,588 miles.

See Notes on Fog and Ice under Routes 777 and 778.

Route 770. Prince Rupert to Yokohama

Take Route 769 (1), (a) or (b), as far as lat. 44° 00′ N., long. 150° 00′ E. ((1) (a)), or lat. 44° 00′ N., long. 152° 00′ E. ((1) (b)). From either point take a Rhumb line track direct to round Nojima saki and thence proceed to Yokohama as directly as navigation permits.

Distance from Prince Rupert to Yokohama using 769 (1) (a), 3,861 miles; using 769 (1) (b), 3,843 miles.

See Notes on Fog and Ice under Routes 777 and 778.

Route 771. Prince Rupert to Guam or Yap

In either case take a Great Circle track direct to Guam. If bound to Yap, proceed from Guam as directly as navigation will permit.

Distance from Prince Rupert to Guam, 4,588 miles; to Yap, 5,039 miles.

Route 772. Prince Rupert to Honolulu

Proceed via Dixon entrance or Hecate strait and from thence take a Great Circle track to destination.

Distance from Prince Rupert to Honolulu, 2,396 miles.

Route 773. Prince Rupert to Pacific islands south of the Equator

(1) To Tahiti. Having cleared Hecate strait, take a Great Circle track to a position in lat. 14° 45′ S., long. 148° 55′ W., north-west of Matahiva, and thence proceed direct to destination.

(2) To Apia.—Take Route 772 to Honolulu, and thence Route 604 to Apia.

(3) To Suva.—Take Route 772 to Honolulu, and thence the relevant part part of Route 504 (1) (a), in reverse, to Suva.

Distance from Prince Rupert to Tahiti, 4,438 miles; to Apia, 4,655 miles; to Suva, 5,179 miles.

Route 774. Prince Rupert to Dutch harbour

Proceed as directly as navigation permits.

Distance from Prince Rupert to Dutch harbour, 1,272 miles.

Route 775. Prince Rupert to ports on West Coast of North America

Pass through Hecate strait and proceed thence as directly as navigation permits to all destinations.

Notes.—For inner passages of British Columbia, *see* British Columbia Pilot, Vols. I and II.

For inner passages in Alaska *see* South-east Alaska Pilot.

From Columbia river to the southward, keep within 15 miles of the coast to avoid the heavy sea experienced further out. From Cape Blanco to the southward, avoid the coastal north-going stream (Davidson current), which is usually felt to about 10 miles out from the land.

See also relevant parts of the General directions and notes under Routes 786 and 785, and West Coast of Central America and United States Pilot.

Distances from Prince Rupert are as follows:—

To Columbia R. (Astoria), 587 miles; to Manzanillo, 2,586 miles; to Panama, 4,330 miles; to San Diego, 1,535 miles; to San Francisco, 1,086 miles; to Vancouver (Inner passage), 475 miles; to Vancouver (Outer passage), 590 miles; to Victoria (Vancouver I.), 518 miles.

Route 776. *Reserved as spare.*

(iii) ROUTES FROM VANCOUVER

Route 777. Vancouver to Hakodate and to ports in China or to Singapore

(1) To Hakodate.—The route at all seasons of the year is the same as far as the 180th meridian, when crossing the ocean, as follows:—

Cross the meridian	130° 00′ W.	at lat.	49° 30′ N.
,, ,, ,,	135° 00′ W.	,,	50° 10′ N.
,, ,, ,,	140° 00′ W.	,,	50° 35′ N.
,, ,, ,,	145° 00′ W.	,,	50° 45′ N.
,, ,, ,,	150° 00′ W.	,,	50° 50′ N.
,, ,, ,,	155° 00′ W.	,,	50° 50′ N.
,, ,, ,,	160° 00′ W.	,,	50° 50′ N.
,, ,, ,,	165° 00′ W.	,,	50° 40′ N.
,, ,, ,,	170° 00′ W.	,,	50° 30′ N.
,, ,, ,,	175° 00′ W.	,,	50° 30′ N.
,, ,, ,,	180° 00′	,,	50° 30′ N.

From this point follow the winter track (a) or summer track (b), as detailed in Route 769 (1) (a) and (b).

(2) To ports in China, or to Singapore.

(a) Via Hakodate.—Take (1), (a) or (b) above to Hakodate, and thence proceed southward as directly as navigation permits, through Korea strait, to destination.

(b) Alternative track (to Shanghai or Hong Kong).—Take a Great Circle track to a position on the 180th meridian in lat. 30° 00′ N., and there join Route 769 (2) (b).

(c) Via Guam (to Hong Kong or Singapore).—Take a Great Circle track direct to Guam after clearing Queen Charlotte sound or Juan de Fuca strait. From Guam take Route 667 to Hong Kong, or Route 668 (2) to Singapore.

Distance from Vancouver to Hakodate by (1) (a), 3,986 miles; by (1) (b), 3,988 miles; to Shanghai by (2) (a), 5,148 miles; by (2) (b), 5,802 miles; to Hong Kong, by (2) (a), 5,797 miles; by (2) (b), 6,352 miles; by (2) (c), 6,705 miles; to Singapore by (2) (a), 7,159 miles; by (2) (c), 7,572 miles.

The distance from Vancouver to the position on the 180th meridian, is 2,757 miles. *See* (2) (b) above.

Distance from Vancouver to Guam via Queen Charlotte sound, 4,905 miles; via Juan de Fuca strait, 4,963 miles.

Notes. Fogs.—Fogs are infrequent over the north-western part of the Pacific ocean in winter, but snow often reduces visibility and impedes navigation. In summer fogs are much more frequent, especially off the north-eastern, eastern and south-eastern coasts of Hokkaidō; they are at their maximum in June and July. *See* Japan Pilot, Vols. I. and II, China Sea Pilot, Vols. I and III, South and East coast of Korea, East coast of Siberia, and Sea of Okhotsk Pilot, and Bering Sea and Strait Pilot, in which full details will be found.

Ice.—See remarks in Chapter I on page 125 and 126.

Route 778. Vancouver to Yokohama

Take Route 777 (1) to the 180th meridian in lat. 50° 30′ N., and thence take Route 769 (1), (a) or (b), according to time of year, as far as lat. 44° 00′ N. From either position (1) (a), or (1) (b), take a direct Rhumb line to lat. 34° 00′ N., long. 140° 00′ E., sighting the coast at Inubō (Inuboye) saki light, (*Lat. 35° 42′ N., Long. 140° 52′ E*). Thence proceed as directly as navigation permits, to destination.

Note.—If preferred, a track closer to the east coast of Honshu may be taken, sighting the land at Kinkasan tō light (*Lat. 38° 17′ N., Long. 141° 35′ E*).

Distance from Vancouver to Yokohama using 769 (1) (a) (Nov. 1st to Mar. 31st), 4,380 miles; using 769 (1) (b) (April 1st to October 31st), 4,362 miles.

Notes.—These routes are usually northward of the westerly winds, and in the track of the west-going current throughout. They lead just to the southward of the Aleutian islands; the winter route passing about 50 miles south-eastward of Amagtignak island.

The east coast of Japan is fully exposed to the strong gales and heavy weather from the eastward prevalent in spring, and the only available harbours are those between Ishi-no-maki kō and Miyako kō.

Fog.—Vessels making this coast from the eastward require to exercise great caution, as the land is frequently obscured by fog, especially in summer.

Those bound to Yokohama are liable to be set from their supposed position by the Kuro shio, but the 10 fathom (18^{m}3) contour line is generally about one mile off, and continual sounding may afford warning, as also the temperature of the sea. During the summer months a swell usually causes heavy breakers on this coast.

See also Notes under Route 777.

Route 779. Vancouver to Guam, Yap and Manila

See Note beginning of Sub-section (iv) of Part IV., Chapter III. on page 157

(1) To GUAM and YAP.—After clearing Queen Charlotte sound or Juan de Fuca strait, take a Great Circle track direct to Guam, and from thence proceed as directly as navigation permits to Yap.

(2) To MANILA.

(a) Via Yokohama.—Take Route 778 to Yokohama, and thence take the reverse of Route 717 (b) via Balintang channel.

(b) Via Hakodate.—Take Route 777 (1) to Hakodate, and thence proceed southward through Korea strait and Formosa strait to Manila, as directly as navigation permits.

(c) Via Guam.—This is the route recommended although it is considerably longer than either (a) or (b); better weather may be expected, and a favourable instead of a strong contrary current will be experienced on the latter part of the voyage. Take (1) above to Guam, and thence Route 668 (1) to Manila.

Distance from Vancouver to Guam via Juan de Fuca strait, 4,963 miles; to Yap, 5,414 miles; to Manila by 2 (a), 6,127 miles; by (2) (b), 6,048 miles; by (2) (c), 6,460 miles.

The distance to Yap or Guam via Queen Charlotte sound is 58 miles less than via Juan de Fuca strait.

Route 780. Vancouver to Honolulu or Fanning island

Take a Great Circle track direct to either destination after passing through Juan de Fuca strait.

Distance from Vancouver to Honolulu, 2,419 miles; to Fanning island, 3,350 miles.

Route 781. Vancouver to Pacific islands south of the Equator

(1) To SUVA or APIA.—Take Route 780 to Honolulu, and thence take Route 604 (2) to Suva, or Route 604 (1) to Apia.

(2) To TAHITI.—Having cleared Juan de Fuca strait, proceed as follows:—

(a) Direct.—Take a Great Circle track to a position in lat. 14° 45′ S., long. 148° 55′ W. and thence proceed direct to Tahiti.

(b) Via Honolulu.—Take Route 780 to Honolulu, and thence Route 604 (1) to Tahiti.

Distance from Vancouver to Suva, 5,202 miles; to Apia, 4,681 miles; to Tahiti by (2) (a), 4,312 miles; by (2) (b), 4,798 miles.

Route 782. Vancouver to Brisbane

(a) Direct route.—From Juan de Fuca strait take a Great Circle track to a position on the Equator in long. 178° 50′ W., passing through the Hawaiian islands to the eastward of Nihoa and about 25 miles eastward of the reported position of Wilder shoal. Thence take the relevant part of Route 540 in reverse to Brisbane.

(b) Via Honolulu.—Take Route 780 to Honolulu and thence take the reverse of Route 540 to Brisbane.

(c) Via Honolulu and Suva.—Take Route 780 to Honolulu and thence the relevant part of Route 504 (1) (a) in reverse as far as Suva. From Suva take Route 542 in reverse to Brisbane.

This route may be used by vessels with a limited radius of action.

Distance from Vancouver to Brisbane by (a), 6,532 miles; by (b), 6,558 miles; by (c), 6,762 miles.

Route 783. Vancouver to Sydney

(a) Direct route.—Take Route 520 (2) (a) in reverse.

(b) Via Honolulu.—Take Route 780 to Honolulu and thence the reverse of Route 504 (1) (b).

(c) Via Honolulu and Suva.—Take Route 780 to Honolulu and thence the reverse of Route 504 (1) (a). Fuel may be obtained at Honolulu and Suva.

Distance from Vancouver to Sydney by (a), 6,936 miles; by (b), 6,966 miles; by (c), 6,937 miles.

Route 784. Vancouver to Wellington

(a) Direct route.—Take the reverse of Route 591 (a).

(b) Via Honolulu.—Take Route 780 to Honolulu and thence proceed as directly as navigation permits by Rhumb line tracks.

Note.—A call at Apia between Honolulu and Wellington adds only about 25 miles to the total distance and enables a vessel with a small radius of action to refuel (coal only at Apia).

(c) Via Honolulu and Suva.—Take Route 780 to Honolulu and thence the relevant part of Route 504 (1) (a) in reverse to Suva. From Suva take Route 653 to Wellington.

Note.—Calling at Suva adds 145 miles to the distance from Honolulu to Wellington, but coal and fuel oil can be obtained.

Distance fron Vancouver to Wellington by (a), 6,448 miles; by (b), 6,533 miles; by (c), 6,678 miles.

Route 785. Vancouver, northward, to ports on West Coast of North America

Passage, northward, may be taken either by passing through Juan de Fuca strait, and outside the islands as directly as navigation permits to destination, or through the inner passages as far as possible, and thence proceeding as directly as navigation permits to destination.

General remarks. Outer route.—The outer route, via Juan de Fuca strait, is that generally used by vessels proceeding to Alaska or the Aleutian islands. The passage from Vancouver to Juan de Fuca strait is made by taking the reverse of one of the routes described in Navigational Notes under Route 741.

Inner passages.—These passages afford smooth water and suitable anchorages at moderate distances apart. They avoid the strong gales and thick weather so frequently met with in Hecate strait and on the Outer route. *See* also Cautions below and under Route 741.

Cautions.—Kelp.—See Route 741.

Fogs.—General.—See Route 741.

(a) Northward of Cape Caution.—Fogs are prevalent, especially during the summer months. The north-west winds, which prevail during that season, condense the vapour which arises from the comparatively warm water surrounding Queen Charlotte islands and the coast of Alaska. During the prevalence of north-west winds this vapour is dispersed, but during calms or with light winds, and especially with south-westerly winds succeeding north-west winds, it approaches quickly from seaward in the form of dense fog, or drizzling mist and rain.

At times fog will be found at the entrances to the sounds during the forenoon, dispersing near noon by the heat of the sun, the afternoons becoming clear and fine.

In the outer part of Queen Charlotte sound it has been observed that the fog, sweeping in from seaward, often broke up after passing the groups of islands blocking the mouth of the sound, making a line of fog-bank stretching between the Gordon and Millar groups, and leaving the area to the south-east of this line comparatively clear.

(b) Alaska.—Northward of the 40th parallel from the coast of America to that of Asia, and especially in the vicinity of the Aleutian islands and in Bering sea, fog is liable to occur at any time, but is most frequent in July, August and September.

(c) Bering sea.—Fog is most prevalent during spring, summer and early autumn, and it generally begins to clear about the middle of October. Fog is almost continuous in summer, but few days are clear from morning to night and the tops of the mountains can seldom be seen. At the surface of the water it is generally sufficiently clear to make out the shore, at a distance of 3 or 4 miles, but at times it is so thick that nothing can be distinguished, and, under such conditions, strangers should not attempt to make the land.

(d) Aleutian islands.—During the summer months the mist and fog are considered to be worse on the southern side than on the northern side of the islands, when in their immediate vicinity.

(e) Juan de Fuca strait.—See Route 741.

(f) "Smokes."—See Route 741.

Ice.—Alaska.—Practically the entire southern coast of Alaska, including the Aleutian islands, is free from ice the entire year. Ice forms at the heads of inlets, when the water is comparatively fresh, and in the rivers, but never in the main channels; in these latter, however, floating patches of slush ice, formed in fresh-water streams and lagoons, are sometimes found, but never form an obstruction to navigation.

For further information regarding the Inner passages and channels, Fog, and Ice, *see* British Columbia Pilot, Vols. I and II; South-east Alaska Pilot; and Bering Sea and Strait Pilot.

(1) To Prince Rupert or Port Simpson.

(a) Outer route.—Proceed through Juan de Fuca strait (Route 741), and thence to Hecate strait; thence either by Ogden channel, Edge passage, or (for large vessels) by Brown passage into Chatham sound.

(b) Inner passages.—From Vancouver to Queen Charlotte sound, pass northward of the Ballenas islands, and thence through Stevens passage, whence course may be shaped for the southern entrance of Discovery passage. From the northern end of Discovery passage, the main route is through Johnstone and Broughton straits into Queen Charlotte strait; for the directions for Discovery passage and Johnstone and Broughton straits, *see* British Columbia Pilot, Vol. I. From the western end of Broughton strait, proceed into Queen Charlotte sound by way of either Goletas or Gordon channels, the usual route being through Goletas channel as far as the Noble islets and thence into Gordon channel through Christie passage.

The following is extracted from the Remark Book of H.M.S. *Danae*, August 1934, and concerns the passage between Comox and Queen Charlotte sound:—

The chief difficulty to be contended with is fog during the summer months. The usual routine appears to be that the fog settles during the night and does not clear until about 10.00, and frequently persists later in the form of banks, which may be only local and small in area but are so dense as to render navigation impossible to a stranger. Those accustomed to these channels navigate largely by siren echo, but as this entails a detailed knowledge of the distance back from the water's edge of the high cliffs at each spot the stranger is debarred from using this method. In view of the prevalence of fog it is essential to study carefully, before starting, the anchorages which are possible for one's own ship and their distances apart. A too ambitious programme for each day should not be expected.

From Queen Charlotte strait to Chatham sound and Prince Rupert the route usually adopted in steam vessels is by way of Fitz Hugh sound (*entrance Lat. 51° 25′ N., Long. 127° 50′ W.*), Lama passage, Seaforth channel, Milbanke sound, Finlayson channel, through Tolmie channel, thence by Graham, Fraser and McKay reaches, to Wright sound, thence by Grenville channel and Chatham sound.

The approach to Fitz Hugh sound from the southward is between the dangerous Sea Otter group on the west and the rocks off the entrance to Smith sound. Vessels from the westward enter by North passage between Sea Otter group and Calvert island.

Westerly gales send in a heavy swell, and dense fogs are of frequent occurence in this vicinity, so that too great care cannot be taken in the navigation.

When passing from Seaforth channel into Milbanke sound, the usual route is eastward and northward of Susan rock.

Finlayson channel is entered about 8 miles northward of Susan rock. Tolmie channel westward of, and parallel to, the northern part of Finlayson channel, is entered at the southern end of Sarah island, about 13 miles within Finlayson channel. It is practically free from danger and is partly lighted.

From the junction of Tolmie channel and Hie-kish narrows, at the northern end of Sarah island, the channel northward is known as Graham reach, and its continuation, as Fraser and McKay reaches, leading to Wright sound and Grenville channel.

Grenville channel, the southern entrance to which is in lat. 53° 22′ N., long. 129° 20′ W., is reached from seaward through Hecate strait, Caamaño and Campania sounds, thence by either Squally or Whale channels.

Grenville channel is clear of dangers in the fairway; at its north-western end, in the fairway, are the Gibson islands, westward of which is the deep channel leading through Arthur and Malacca passages into Chatham sound, and to Prince Rupert harbour and Port Simpson.

(2) To WRANGELL (*Lat. 56° 29′ N., Long. 132° 23′ W*).

(a) Outer route.—After passing through Juan de Fuca strait, steer northwards outside Queen Charlotte islands, and pass through Dixon entrance, and thence proceed through Clarence strait and Stikine strait to destination. Passage may be made also through Hecate strait to Clarence strait.

(b) Inner passage.—Take (1) (b) above as far as Queen Charlotte sound, and thence proceed via Hecate strait, and Dixon entrance, Revillagigedo channel and Tongass marrows to Clarence strait; thence by Stikine strait to Wrangell; the trading steamers making detours to visit Port Chester and the various fishing stations en route.

(3) To JUNEAU.

(a) Outer route.—From Juan de Fuca strait, steer through Hecate strait, thence through Dixon entrance to Chatham strait, and thence proceed through Frederick sound and Stephens passage to Juneau.

(b) Inner passage.—First take (2) (b) above as far as Wrangell. From Wrangell harbour, the route continues through Wrangell (narrows) strait, which with local knowledge is navigable by vessels of any class that can be used in these waters, and through Stephens passage to Juneau.

(4) To SITKA.—Proceed via Hecate strait, and thence direct to Sitka.

(5) To OTHER PORTS OF SOUTHERN ALASKA.—Proceed through Juan de Fuca strait, and thence as directly as circumstances will permit.

(6) To SKAGWAY.—Take (3) (b) above as far as Juneau, and thence pass through Stephens passage and Favourite channel into Lynn canal, at the head of which is Skagway.

Notes.—Large vessels from Wrangell should pass out of Summer strait round Cape Decision, and up Chatham strait to Frederick sound and thence into the Lynn canal.

The outer passage, through Cross sound and Icy strait into the Lynn canal, is not recommended, for though there are no difficulties to navigation, as regards rocks, etc., at times great quantities of ice-floes drifting with the strong currents render the passage somewhat dangerous, and only to be undertaken in clear weather, or daylight.

Distances from Vancouver are:—

To Etches, Port, by (5), 1,192 miles.
To Juneau, by (3) (a), 760 miles.
To Prince Rupert, by (1) (a), 475 miles.
To St. Paul, Kodiak I., by (5), 1,273 miles.
To Simpson, Port, by (1) (a), 490 miles.
To Sitka, by (4), 707 miles.
To Skagway, by (6), 867 miles.
To Wrangell, by (2) (a), 630 miles.
To Yakutat bay, by (5), 1,024 miles.

Route 786. Vancouver, southward, to ports on west coast of North and Central America

General directions (See West Coast of Central America and United States Pilot).—Proceed from Burrard inlet to Juan de Fuca strait by the reverse of Route 741, and on to the southward. Keep within 15 miles of the coast, in order to avoid the heavy seas felt farther out. A south going current will be experienced throughout the whole distance to the entrance of Panama bay; but after passing Cape Blanco (*Lat. 42° 50′ N.*), the Davidson current, north-going, will be felt within 10 miles of the coast.

Notes.—Off San Francisco in clear weather, vessels may pass midway between South and Middle Farallones in 18 fathoms (32^{m}9) or midway between Middle and North Farallones, in 36 fathoms (65^{m}8), but the more prudent course is to keep to the southward of South Farallon.

At night and in thick weather vessels should always go to southward of South Farallon.

Fogs.—Fogs form about Cape Mendocino *(Lat. 40° 26′ N., Long. 124° 24′ W.*), and bank against it densely. Sometimes a vessel will carry clear weather from Juan de Fuca strait to the cape and then encounter fogs that reach to San Francisco.

See also Routes 740 and 741.

The Farallones are frequently enveloped in fog, and therefore, in approaching them in such weather, the utmost care and vigilance must be observed, the more especially as the peculiarities of the ocean currents in the vicinity have not been determined.

Distance from Vancouver to Astoria (Columbia R.), 280 miles; to Manzanillo, 2,337 miles; to Panama, 4,050 miles; to San Diego, 1,255 miles; to San Francisco, 810 miles.

Route 787. Vancouver to ports on west coast of South America

Join Routes 804, to Callao; 805, to Valparaiso; or 806, to Estrecho de Magallanes, off San Francisco (*see* Route 786).

The distance from Vancouver is about 800 miles greater than that given from San Francisco.

Route 788.—*Reserved as spare.*

Route 789.—*Reserved as spare.*

(iv) ROUTES FROM SAN FRANCISCO

Route 790. San Francisco, northward, to ports on mainland of North America

Proceed as directly as possible within 10 miles of the coast as far as Cape Blanco (*Lat. 42° 50′ N.*), in order to keep in the Davidson north-going coast-current; and afterwards within 15 miles of the coast, in order to avoid the heavy sea experienced further out, though a contrary current will then be felt.

Note.—More detailed directions will be found in "Coastal Navigation" in Chapter I of the West coast of Central America and United States Pilot.

Distances from San Francisco are:—

To Astoria (Columbia R.), 562 miles; to Etches, Port, 1,655 miles; to Juneau, 1,371 miles; to Prince Rupert, 1,086 miles; to Skagway, 1,454 miles; to Vancouver, 810 miles; to Wrangell, 1,236 miles.

See Route 785 for details of Inner passages, Navigational Notes, and Cautions.

Route 791. San Francisco to Dutch harbour or St. Paul (Kodiak I.).

Take a Great Circle track direct to either destination; pass through Unimak pass or Akutan pass according to weather conditions if bound to Dutch harbour.

Distance from San Francisco to Dutch harbour, 2,053 miles; to St. Paul, 1,690 miles.

Route 792. San Francisco to Hakodate

There are two northern routes, (a) and (b), to be taken according to season, and one, more to the southward, (c). On all of the above routes a contrary current will be experienced throughout the whole voyage.

A fourth route, (d), via Dutch harbour would enable a vessel to re-fuel. Although only 115 miles longer than (a), or (b), and 84 miles longer than (c), more unfavourable weather can be expected. A favourable current may be carried, however, over part of the route.

(a) November 1*st to March* 31*st*.—Take a Great Circle track to a position in lat. 50° 30′ N., long. 180° 00′, to join Route 769 (1) (a).

(b) April 1*st to October* 31*st*.—Take a Great Circle track as in (a) but there join Route 769 (1) (b).

(c) Alternative route.—Take the Great Circle track to Yokohama (*see* Route 793 below) as far as long. 163° 40′ E. in lat. 44° 40′ N., and thence take a Rhumb line track direct to Hakodate.

Note.—The highest latitude reached on this route is 47° 30′ N., at long. 170° 00′ W.

(d) Via Dutch harbour.—Take Route 791 to Dutch harbour, and thence take Route 762 to Hakodate.

Distance from San Francisco to Hakodate by (a), 4,251 miles; by (b), 4,250 miles; by (c), 4,282 miles; by (d), 4,366 miles.

Route 793. San Francisco to Yokohama

(a) Direct route.—Take a Great Circle track direct; the highest latitude reached is 47° 30′ N., at long. 170° 00′ W. Summer route only (*See* (c) below.

Note.—A contrary current will be experienced throughout the whole voyage.

(b) Via Dutch harbour.—Take Route 791 to Dutch harbour, and thence Route 762 to Yokohama.

Note.—This route would enable a vessel to re-fuel on the route. Although only 133 miles longer than (a), more unfavourable weather may be expected, but a favourable current may be carried over part of the voyage. *See* (c) below.

(c) Southern route.—Take Rhumb line tracks across the ocean as follows:—From San Francisco first to lat. 37° 00′ N., long. 130° 00′ W. and thence to lat. 35° 00′ N., long. 140° 00′ W. Steer along the parallel of 35° 00′ N. to long. 141° 00′ E.; and thence as directly as navigation permits to destination. This track avoids the bad weather and the strength of the contrary current, until approaching Japan; it is recommended for use by low-powered vessels at all seasons of the year, and by all vessels except during the summer months (June to September inclusive) when (a) or (b) may be taken.

For vessels taking a southern route and having a radius of action insufficient for a non-stop passage, the voyage may be made via Honolulu (Route 794) and thence on Route 607 to Yokohama. The distance will be 5,480 miles or 640 miles longer than the non-stop southern route.

Distance from San Francisco to Yokohama by (a), 4,536 miles; by (b), 4,669 miles; by (c), 4,840 miles.

Route 794. San Francisco to Honolulu or Fanning island

In either case take a Great Circle track direct.

Distance from San Francisco to Honolulu, 2,091 miles; to Fanning island, 2,881 miles.

Route 795. San Francisco to Tahiti

Take a Great Circle track direct to a position in lat. 14° 50′ S., long. 148° 43′ W., about 10 miles northwest of Matahiva, Archipel des Tuamotu, and thence proceed direct to Tahiti.

Distance from San Francisco to Tahiti, 3,666 miles. *See* Note under Route 619.

Route 796. San Francisco to Apia or Suva

(1) To Apia.

(a) Direct route.—Take the Great Circle track direct.

(b) Via Honolulu.—Take Route 794 to Honolulu, and thence Route 604 (1) to Apia.

(2) To Suva.

(a) Direct route.—Take the Great Circle track direct.

(b) Via Honolulu.—Take Route 794 to Honolulu, and thence take Route 604 (2) to Suva.

Distance from San Francisco to Apia by (1) (a), 4,165 miles; by (1) (b), 4,351 miles; to Suva, by (2) (a), 4,756 miles; by (2) (b), 4,874 miles.

Note.—Vessels with a very small radius of action may take the passage from Honolulu to Suva via Apia (Route (1) (b) above and 637). The total distance is increased by only 120 miles. Only coal is available at Apia.

Route 797. San Francisco to Guam and Yap

First take one of the two following routes to Guam and thence, if bound to Yap, proceed as directly as navigation permits.

(a) Direct route.—Take a Great Circle track direct to Guam.

(b) Via Honolulu.—Take Route 794 to Honolulu, and thence Route 609 to Guam.

Distance from San Francisco to Guam by (a), 5,053 miles; by (b), 5,421 miles.

The distance from Guam to Yap is 451 miles.

Route 798. San Francisco to ports in China, and to Singapore

Take one of the following routes, that via Hakodate (except to Singapore) being the shortest; the seasonal routes (f) have been recommended by some experienced navigators.

On routes (a) and (b), which are recommended for use only between June and September inclusive, the current will be adverse over a very large part of the passage, and stormy weather is very probable. On routes (c), (d), (e) and (f) (ii) and (iii), better weather and a favourable current over a considerable portion of the journey can be expected. Routes (c) and (d) enable a vessel to re-fuel at Guam or Honolulu, or both, if her bunker capacity is insufficient for the long run to Hakodate or Yokohama, or by the alternative routes (e) and (f).

Except during the period June to September inclusive, it is probable that a faster non-stop passage will be made by (e) or (f) than by (a) or (b).

(a) Via Hakodate.—Take Route 792 (a), (b), (c), or (d) to Hakodate, and thence proceed southward as directly as navigation permits, through Korea strait, to destination.

(b) Via Yokohama.—Take Route 793 (a) or (b) to Yokohama, and thence take either Route 750 to Singapore, Route 751 to Hong Kong, Route 752 (1), (a) or (b), to Shanghai, or Route 752 (2), (a) or (b), to Kiaochow or ports in the Gulf of Pohai.

(c) Via Guam.—Take Route 797 (a) to Guam, and thence take either Route 666 to Shanghai, Route 667 to Hong Kong, or Route 668 (2) to Singapore.

(d) Via Honolulu and Guam.—Take Route 797 (b) to Guam, and thence proceed as in (c).

(e) Alternative route.—Take a Great Circle track direct from San Francisco to a position in lat. 30° 00′ N. on the 180th meridian to join Route 769 (2) (b).

(f) Seasonal routes.—The following seasonal routes, for vessels not making an intermediate port of call, have been recommended.

(i) June, July, August and September.—If the radius of action does not necessitate a call at Yokohama, take a Great Circle track to a point in lat. 19° 45′ N., long. 122° 07′ E., in the Balintang channel; or to a point in lat. 18° 40′ N., long. 122° 10′ E., northward of Cape Engaño, Luzon island; the latter is recommended as probably the strength of the adverse Kuro shio current will be less on that route.

To Fochow leave the Great Circle at a convenient point to pass southward of Okinawa. To ports southward of Foochow pass through either Bashi or Balintang channels, or via Cape Engaño.

To Shanghai it is probably best to follow Route 793 as in (b) above, or leave the Engaño route after passing through Nanpo shotō, or as for Foochow.

(*ii*) *April, May, October and November.*—As strong westerlies and gales may be still expected in the northern part of the North Pacific ocean, take a Rhumb line track direct to either the Balintang channel or to Cape Engaño. Thence proceed as directly as navigation permits to destination. *See* Notes below.

(*iii*) *December, January, February and March.*—First proceed direct to a point in lat. 30° 00′ N., long. 140° 00′ W., and then take a Rhumb line track direct to either the Balintang or the Bashi channel, or to Cape Engaño. Thence proceed as directly as navigation permits to destination. *See* Notes below.

Notes.—Routes (c), (d), (e) and (f) are intended for vessels bound to ports from Shanghai to the southward.

By routes (f) (ii) and (f) (iii) the following are suggested as suitable points for leaving the trans-ocean route when bound to various ports.

(a) *To ports from Foochow northward.*—

(*i*) *Via* (*f*) (*ii*).—Leave either route (*Balintang or C. Engano*) at long 150° E., and proceed southward of Kazan rettō and Okinawa guntō to destination.

(*ii*) *Via* (*f*) (*iii*).—Leave the *Bashi route* at long. 150° E. and continue as in (a) (i).

(b) *To China ports south of Foochow.*—

(*i*) *Via* (*f*) (*ii*).—Follow the *Balintang* route, or leave the same at long. 150° E. and steer for the *Bashi channel;* in either case continue as directly as navigation permits to destination.

(*ii*) *Via* (*f*) (*iii*).—Take *Balintang* channel or *Bashi* channel route to destination.

(c) *To Manila or Singapore.*—By either (f) (ii) or (iii) take the *C. Engano* route and thence continue as directly as navigation permits to destination. *See* Route 799.

Distance from San Francisco to the various ports is as follows:—

To Hong Kong, by (a), 6,061 miles; by (b), 6,120 miles; by (c), 6,853 miles; by (d), 7,021 miles by; (e), 6,452 miles; by (f) (i), 6,234 miles; by (f) (ii), 6,550 miles; by (f) (iii), 6,744 miles.

To Kiaochow by (a), 5,425 miles; by (b), 5,658 miles.

To Shanghai by (a), 5,400 miles; by (b), 5,572 miles; by (c), 6,737 miles; by (d), 7,105 miles; by (e), 5,902 miles; by (f) (i), 5,823 miles; by (f) (ii), 6,217 miles; by (f) (iii), 6,410 miles.

To Singapore by (a), 7,424 miles; by (b), 7,424 miles; by (c), 7,720 miles; by (d), 8,088 miles; by (e), 7,777 miles; by (f) (i), 7,365 miles; by (f) (ii), 7,697 miles; by (f) (iii), 7,902 miles.

To Taku by (a), 5,610 miles; by (b), 5,850 miles.

Route 799. San Francisco to Manila

The passage may be made via Honolulu or via Honolulu and Guam, or by one of the seasonal routes given in (c). The latter are for vessels whose radius of action does not necessitate a call at an intermediate port for fuel.

(*a*) *Via Honolulu.*—Take Route 794 to Honolulu, and thence Route 611 (a) to Manila.

(*b*) *Via Honolulu and Guam.*—Take Route 794 to Honolulu, and thence Route 611 (b) to Manila via Guam.

(*c*) *Seasonal routes.*—Take one of the seasonal routes described in Route 798 (f) as far as Cape Engaño, and thence continue round the north and west coasts of Luzon to Manila.

See Caution at the beginning of Sub-section (iv) of Part (iv), Chapter III., on page 157.

Distance from San Francisco to Manila by (a), 6,853 miles; by (b), 6,918 miles by (c), using 798 (f) (i), 6,232 miles; using 798 (f) (ii), 6,564 miles; using 798 (f) (iii), 6,769 miles.

Route 800. San Francisco to Brisbane

(*a*) *Via Honolulu.*—Take Route 794 to Honolulu, and thence take the reverse of Route 540 to Brisbane.

(*b*) *Via Honolulu and Suva.*—Take Route 794 to Honolulu; thence Route 604 (2) (*i.e.* the relevant part of Route 504 (1) (a), in reverse to Suva. From Suva take the reverse of Route 542 (*see* Route 654 (2)).

Distance from San Francisco to Brisbane by (a), 6,230 miles; by (b), 6,434 miles.

Note.—Route (b) is intended for a vessel with a limited radius of action, the longest run being 2,783 miles between Honolulu and Suva. The longest run can be reduced to 2,262 miles if a call is made at Apia; the total distance is increased by 123 miles, but coal only is available at Apia.

Route 801. San Francisco to Sydney

(*a*) *Via Honolulu.*—Take Route 794 to Honolulu. From Honolulu steer a direct course to cross the equator at about long. 178° 50′ W., thence to cross the lat. of 10° S. at long. 170° E., passing 40 miles south-eastward of Arorae (the southernmost of the Gilbert islands group) and the same distance north-westward of the Nanumea (the northernmost of the Ellice island group). From lat. 10° S., long. 170° E. steer as directly as navigation permits between the Santa Cruz islands group, and the Torres islands (northward of the New Hebrides), to a position lat. 20° 00′ S., long. 156° 30′ E., about 100 miles westward of the Bampton and Chesterfield reefs.

Thence proceed midway between Bellona reefs, to the eastward, and Kenn reef, Wreck reef, and Cato island, to the westward, as directly as navigation permits to Sydney.

Note.—The voyage from Honolulu to Sydney may also be made southward of the New Hebrides and New Caledonia. It is shorter by 120 miles but, as it leads through the midst of the Ellice islands and Phœnix islands, is not recommended.

(*b*) *Via Honolulu and Suva.*—Take Route 800 (b) as far as Suva; thence take the reverse of Route 503 (1) to Sydney.

See Note under Route 800 which applies equally to (b) above.

Distance from San Francisco to Sydney by (a), 6,636 miles; by (b), 6,609 miles.

Route 802. San Francisco to Wellington

(*a*) *Direct route.*—Take a Great Circle track direct crossing the Equator in long. 151° 00′ W. *See* Note under Route 592 (a).

(*b*) *Via Honolulu.*—Take Route 794 to Honolulu, and thence take a Rhumb line track to destination.

Note.—A call at Apia on the passage from Honolulu adds only 25 miles to the total distance. A small stock of coal is available at Apia.

(*c*) *Via Tahiti.*—Take Route 795 to Tahiti, and thence take a Great Circle track direct to Wellington.

(*d*) *Via Apia (direct).*—Take Route 796 (1) (a) to Apia and thence proceed as directly as navigation permits to Wellington.

Distance from San Francisco to Wellington by (a), 5,906 miles; by (b), 6,204 miles; by (c), 6,016 miles; by (d), 6,046 miles.

Route 803. San Francisco to Panama and intermediate ports

Proceed southward, along the coast, as directly as navigation permits. *See* General directions in Route 786 and " Coastal Navigation " in Chapter I of the West coasts of Central America and United States Pilot.

Distance from San Francisco to San Diego, 450 miles; to Manzanillo, 1,535 miles; to Panama, 3,246 miles.

Route 804. San Francisco to Callao

(a) Direct route.—After clearing the land to a distance of about 40 miles, take a direct Rhumb line, course to a position lat. 26° 40′ N., long. 115° 00′ W., and thence take a second Rhumb line, direct to destination, passing eastward of the Archipielago de Colon (Islas Galápagos).

(b) **Via Manzanillo.**—Proceed direct to Manzanillo (Route 803), and thence on a Rhumb line track direct to Callao.

Distance from San Francisco to Callao by (a), 3,988 miles; by (b), 4,006 miles.

Route 805. San Francisco to Valparaiso

(a) Direct route.—First take a Rhumb line track to a position in lat. 26° 40′ N., long. 115° 00′ W., and thence a second Rhumb line to a position in lat. 7° 00′ S., long. 90° 00′ W. From this point proceed on a Great Circle track direct to Valparaiso.

(b) Via Manzanillo and Callao.—Take Route 804 (b) to Callao, and thence proceed on a Rhumb line track direct to Valparaiso.

Note.—Instead of taking a Rhumb line direct from Callao to Valparaiso, the coast may be followed at a convenient distance; the increase in distance is about 120 miles.

Whether proceeding direct or along the coast, a contrary current, up to between 20 and 30 miles a day, may be expected between Callao and Valparaiso.

Distance from San Francisco to Valparaiso by (a), 5,140 miles; by (b), 5,305 miles.

Route 806. San Francisco to Estrecho de Magallanes (Cabo Pilar)

(a) Direct route.—Take first a Rhumb line to pass westward of Isla Guadalupe (*Lat. 29° 11′ N., Long. 118° 18′ W.*). Thence take a Great Circle track to cross the Equator in long. 106° 30′ W., and thence a second Great Circle track to Cabo Pilar.

Note.—The track passes through Islas Revilla Gigedo between Roca Partida and Clarion island; it also passes about 70 miles west of Clipperton island, and some 45 miles west of Germaine bank (*Lat. 5° 09′ N., Long. 107° 35′ W.*).

(b) Alternative coastal route.—Take Route 805 (b) to Valparaiso, and proceed thence as directly as navigation permits along the coast to Cabo Pilar.

Distance from San Francisco to Cabo Pilar by (a), 5,990 miles; by (b), 6,529 miles.

Route 807.—*Reserved as spare.*

Route 808.—*Reserved as spare.*

(v) ROUTES FROM SAN DIEGO

Route 809. San Diego, northward, to ports on mainland of North America

Proceed as in Route 790. *See* also Route 785 for details of Inner passages, Navigational Notes and Cautions.

Distances from San Diego are:—

To Astoria (Columbia R.), 981 miles; to Etches, Port, 2,074 miles; to Juneau, 1,790 miles; to Prince Rupert, 1,505 miles; to San Francisco, 450 miles; to Skagway, 1,873 miles; to Vancouver, 1,229 miles; to Wrangell, 1,873 miles.

Route 810. San Diego to Dutch harbour

Having cleared Santa Barbara islands take a Great Circle track to Akutan pass or Unimak pass, according to weather conditions Thence proceed as directly as navigation permits to destination.

Distance from San Diego to Dutch harbour, 2,442 miles.

Route 811. San Diego to Hakodate

There are two northern routes, (a) and (b), to be taken, according to season, and one, more to the southward (c). On all these three a contrary current will be experienced throughout the whole voyage.

A fourth route (d), via Dutch harbour, enables a vessel to re-fuel if necessary. Although only 103 miles longer than (a) or (b), and 120 miles longer than (c), more unfavourable weather can be expected; a favourable current, however, may be carried over part of the route.

(a) November 1st to March 31st.—After clearing Santa Barbara islands take a Great Circle track to a position in lat. 50° 30′ N., long. 180° 00′ to join Route 769 (1) (a).

(b) April 1st to October 31st.—Take the Great Circle track as in (a), but there join Route 769 (1) (b).

(c) Alternative route.—Having cleared Santa Barbara islands take a Great Circle track to a position in lat. 44° 40′ N., long. 163° 40′ E. to join Route 792 (c).

(d) Via Dutch harbour.—Take Route 810 to Dutch harbour, and thence take Route 762 to Hakodate.

Distance from San Diego to Hakodate by (a), 4,652 miles; by (b), 4,651 miles; by (c), 4,635 miles; by (d), 4,755 miles.

Route 812. San Diego to Yokohama

(a) Direct route.—Take a Great Circle track direct after clearing Santa Barbara islands.

(b) Via Dutch harbour.—Take Route 810 to Dutch harbour, and thence Route 762 to Yokohama.

(c) Southern direct route.—Take a Rhumb line track to a position in lat. 34° 50′ N., long. 140° 00′ E., and thence proceed as directly as navigation permits to destination.

(d) Via Honolulu.—Take a Great Circle track (Route 813) to Honolulu, and thence Route 607 (a) or (b) to Yokohama.

Notes.—Routes (a) and (b) are recommended for use by full-powered vessels only in June, July, August and September. Routes (c) and (d) are for the use of low-powered vessels at all seasons, and of other vessels between October and May inclusive.

A contrary current may be expected throughout the whole of (a) above.

On (b) more unfavourable weather is likely, but a favourable current may be carried over part of the route. Fuel is obtainable at Dutch harbour.

On (c) and (d), the bad weather and the strength of the contrary current (until approaching Japan) will be probably rather less.

Distance from San Diego to Yokohama by (a), 4,923 miles; by (b), 5,058 miles; by (c), 5,175 miles; by (d), using 607 (a), 5,705 miles; by (d), using 607 (b), 5,664 miles.

Route 813. San Diego to Honolulu or Fanning island

Take a Great Circle track direct to either destination.

Distance from San Diego to Honolulu, 2,275 miles; to Fanning island, 2,939 miles.

Route 814. San Diego to Tahiti

Take a Great Circle track to a position in lat. 14° 50′ S., long. 148° 43′ W., about 10 miles northwest of Matahiva, Archipel des Tuamotu, and thence proceed direct to Tahiti.

Distance from San Diego to Tahiti, 3,550 miles. *See* Note under Route 619 regarding vessels with a small radius of action.

Route 815. San Diego to Apia or Suva

(a) Direct route.—Take a Great Circle track direct to either destination.

(b) Via Honolulu.—Take Route 813 to Honolulu and thence Route 604 (1) to Apia, or Route 604 (2) to Suva.

Distance from San Diego to Apia by (a), 4,196 miles; by (b), 4,535 miles; to Suva by (a), 4,811 miles; by (b), 5,058 miles.

Route 816. San Diego to Guam and Yap

Take one of the following routes to Guam, and thence, if bound to Yap, proceed as directly as navigation permits.

(a) Direct route.—Take a Great Circle track, direct to Guam.

(b) Via Honolulu.—Take Route 813 to Honolulu and thence take Route 609 to Guam.

Distance from San Diego to Guam by (a), 5,380 miles; by (b), 5,605 miles.

The distance from Guam to Yap is 451 miles.

Route 817. San Diego to ports in China, Singapore, Australia and New Zealand

General statement.

(a) Direct and Alternative routes.—The general directions for these routes are the same as those given in Routes 798 to 802 inclusive.

(b) Composite routes.—Proceed as from San Francisco (Routes 798 to 802) taking first one of Routes 812 to 816 inclusive.

Route 818. San Diego to Panama and intermediate ports.

Proceed southward along the coast as directly as navigation permits. *See* "Coastal Navigation" in West Coast of Central America and United States Pilot.

Distance from San Diego to Manzanillo, 1,128 miles; to Panama, 2,839 miles.

Route 819. San Diego to Callao

(a) Direct route.—Steer first to a position in lat. 30° 00′ N., long. 117° 30′ W., and thence to lat. 26° 40′ N., long. 115° 00′ W. From this point take a Rhumb line track direct to Callao, passing eastward of Archipelago de Colon (Islas Galápagos).

(b) Via Manzanillo.—Take Route 818 above to Manzanillo, and thence continue on a Rhumb line direct to Callao.

Distance from San Diego by (a), 3,581 miles; by (b), 3,599 miles.

Route 820. San Diego to Valparaiso

(a) Direct route.—Proceed to lat. 26° 40′ N., long. 115° 00′ W., as in Route 814 (a) above. Thence take a Rhumb line track to lat. 7° 00′ S., long. 90° 00′ W., and thence a Great Circle track direct to Valparaiso.

(b) Via Manzanillo and Callao.—Take Route 819 (b) to Callao, and thence proceed on a Rhumb line track direct to Valparaiso. *See* Note after Route 805.

Distance from San Diego to Valparaiso by (a), 4,733 miles; by (b), 4,898 miles.

Route 821. San Diego to Estrecho de Magallanes (Cabo Pilar)

(a) Direct route.—Take a Rhumb track to a position in lat. 20° 00′ N., long. 114° 25′ W., to join Route 806 from San Francisco to Estrecho de Magallanes.

(b) Alternative coastal route.—Take Route 820 (b) to Valparaiso, and thence proceed as directly as navigation permits along the coast to Cabo Pilar. *See* Note after Route 805.

Distance from San Diego to Cabo Pilar by (a), 5,592 miles; by (b), 6,122 miles.

Route 822.—*Reserved as spare.*

Route 823.—*Reserved as spare.*

(vi) ROUTES FROM MANZANILLO

Route 824. Manzanillo to San Diego or San Francisco

Proceed as directly as navigation permits. An adverse current will be experienced until Point Conception when the Davidson Inshore current, running north-westward may be picked up.

Distance from Manzanillo to San Diego, 1,128 miles; to San Francisco, 1,535 miles.

Route 825. Manzanillo to Honolulu

Take a Great Circle track direct.

Distance from Manzanillo to Honolulu, 3,016 miles.

Route 826. Manzanillo to Tahiti

Take a Great Circle track to a position in lat. 6° 30′ S., long. 140° 00′ W., northward of Îles Marquises, and thence take a Rhumb line track to a position in lat. 14° 43′ S., long. 148° 53′ W., northwest of Matahiva, Archipel des Tuamotu. From this point steer direct to destination.

Distance from Manzanillo to Tahiti, 3,495 miles.

Route 827. Manzanillo to Apia

(a) Direct route.—Take a Great Circle track to a position in lat. 12° 09′ S., long. 170° 00′ W. *(see* Route 828), and thence proceed direct to Apia.

(b) Via Tahiti.—Take Route 826 to Tahiti, and thence proceed as directly as navigation permits to Apia (Route 622 (3)).

(c) Via Honolulu.—Take Route 825 to Honolulu, and thence Route 604 (1) to Apia.

Distance from Manzanillo to Apia by (a), 4,456 miles; by (b), 4,800 miles; by (c), 5,276 miles.

Note.—Vessels with a very small radius of action can take Route 824 to San Diego, and thence Route 815 (b) to Apia. The total distance by this route is 5,663 miles, but the longest continuous run is 2,275 miles.

Route 828. Manzanillo to Suva

(a) Direct route.—Take a Great Circle track to a position in lat. 13° 20′ S., long. 173° 00′ W., northwest of Savaii, Samoa islands, passing through lat. 12° 09′ S., long. 170° 00′ W. *(see* Route 827 (a)). Thence steer to pass through Nanuku passage to Suva.

(b) Via Tahiti.—Take Route 826 to Tahiti, and thence Route 622 (4) to Suva.

(c) Via Honolulu.—Take Route 825 to Honolulu and thence Route 604 (2) to Suva.

Note.—Vessels with a very small radius of action can proceed via San Diego, Honolulu and Apia to Suva. The total distance is 6,307 miles, but the longest continuous run is 2,275 miles.

Distance from Manzanillo to Suva by (a), 5,068 miles; by (b), 5,330 miles; by (c), 5,799 miles.

Route 829. Manzanillo to Panama

Proceed as directly as navigation permits.

Distance from Manzanillo to Panama, 1,719 miles.

Route 830. Manzanillo to Callao

Take a Rhumb line track direct.

Distance from Manzanillo to Callao, 2,471 miles.

Route 831. Manzanillo to Valparaiso

(a) Direct route.—Take a Great Circle track direct.

(b) Via Callao.—Take Route 830 to Callao, and thence take a Rhumb line track direct to Valparaiso. *See* Note after Route 805.

Distance from Manzanillo to Valparaiso by (a), 3,652 miles; by (b), 3,770 miles.

Route 832. Manzanillo to Estrecho de Magallanes (Cabo Pilar)

(a) Direct route.—Take a Great Circle track direct.

(b) Alternative coastal route.—Take Route 831 (b) to Valparaiso *(see* Note after Route 805), and thence proceed as directly as navigation permits, along the coast, to Cabo Pilar.

Distance from Manzanillo to Cabo Pilar by (a), 4,581 miles; by (b), 4,994 miles.

Route 833.—*Reserved as spare.*

(vii) ROUTES FROM PANAMA

For Routes from Panama (via Colon) to ports in the Atlantic ocean, see Section B., Part I., Chapter III.

Note.—To Atlantic ports north of Rio de la Plata the shortest distance from Panama is via the Panama canal; to ports southward of Rio de la Plata it is via Estrecho de Magallanes (Magellan strait).

The comparative distances to Rio de la Plata entrance are: Via Panama canal, 5,282 miles; via Estrecho de Magallanes, 5,214 miles.

Route 834. Panama to western ports of North America

Proceed as directly as navigation permits. Along the Californian coast and to the northward, steamers should follow the coast from point to point, as nearly as possible, always within 15 miles of the land. By this means the strong north-west wind will frequently be avoided, as calms will often be found close in with the shore when there is a wind to seaward. The north-going Davidson current will be felt, also, within 10 miles of the coast, as far north as Cape Blanco (*lat. 42° 50′ N.*).

Distances from Panama are:—

To Acapulco, 1,428 miles; to Astoria (Columbia R.), 3,800 miles; to Manzanillo, 1,719 miles; to Mazatlan, 2,003 miles; to Prince Rupert, 4,330 miles; to Puntarenas, 465 miles; to San Diego, 2,839 miles; to San Francisco, 3,246 miles; to Vancouver, 4,050 miles.

Route 835. Panama to Honolulu

Having cleared Panama bay, steer to a position in lat. 6° 45′ N., long. 81° 00′ W., and thence take a Great Circle track direct to destination.

Distance from Panama to Honolulu, 4,683 miles.

Note.—A vessel with a small, or very small radius of action may proceed to Honolulu via San Diego, or via Manzanillo and San Diego. The total distance in the former case is 5,114 miles, and in the latter it is, 5,122 miles. The longest unbroken passage is 2,839 miles in the former and 2,275 in the latter case.

Route 836. Panama to Tahiti

Proceed as directly as navigation permits out of the Gulf of Panama and, from a position in lat. 6° 45′ N., long. 81° 00′ W., take a Great Circle track to a position in lat. 13° 35′ S., long. 145° 15′ W., about 60 miles north-eastward of Manihi atoll, Archipel des Tuamotu. Thence proceed to Tahiti round Matahiva as directly as navigation permits.

Distance from Panama to Tahiti, 4,570 miles.

Note.—For vessels with a radius of action of less than 4,000 miles, the passage may be made via Manzanillo (fuel and diesel oil only). The distance to Tahiti is increased by 644 miles.

Route 837. Panama to Apia

(a) Direct route.—Take Route 838 (a), Panama to Suva, direct, as far as a position in lat. 10° 45′ S., long. 136° 35′ W.; thence proceed on a Great Circle track direct to Apia.

(b) Via Tahiti.—Take Route 836 to Tahiti and thence proceed as directly as navigation permits to Apia (Route 622 (3)); the distance is only 160 miles greater than (a)

(c) Via Manzanillo, San Diego, and Honolulu.—Take Route 834 to Manzanillo, thence Route 824 to San Diego, thence Route 813 to Honolulu, and thence Route 604 (1) to Apia.

Note.—This route is designed for vessels with a very small radius of action. The total distance is 1,670 miles greater than (a), but the longest non-stop run is only 2,275 miles.

Distance from Panama to Apia by (a), 5,709 miles; by (b), 5,870 miles; by (c), 7,382 miles.

Route 838. Panama to Suva

(a) Direct route.—Take Route 836 as far as lat. 6° 30′ S., long. 120° 00′ W.; thence take a Great Circle track to Nanuku passage, Fiji islands, and thence proceed as directly as navigation permits to Suva.

(b) Via Tahiti.—Take Route 836 to Tahiti, and thence Route 622 (4) to Suva.

(c) Via Manzanillo, San Diego, Honolulu and Apia.—Take Route 837 (c) to Apia, and thence take Route 637 to Suva. *See* Note after Route 837 (c).

Distance from Panama to Suva by (a), 6,323 miles; by (b), 6,405 miles; by (c), 8,026 miles.

Route 839. Panama to Yokohama

The direct Great Circle route is 7,680 miles in length; it is beyond the radius of action of many vessels, and an adverse current can be expected over the greater part of the passage. The route via Honolulu is recommended therefore for all vessels.

(a) Direct route.—Proceed as directly as navigation permits to a position about 12 miles southward of Cabo Falso, in lat. 22° 40′ N., long. 110° 00′ W., and thence take a Great Circle track direct to the approaches to Yokohama.

(b) Via Honolulu.—Take Route 835 to Honolulu, and thence Route 607 (a) or (b) to Yokohama.

(c) Via Manzanillo and Honolulu.—Take Route 834 to Manzanillo, thence Route 825 to Honolulu, and thence Route 607 (a) or (b) to Yokohama.

(d) Via San Diego and Honolulu.—Take Route 834 to San Diego, thence Route 813 to Honolulu, and thence Route 607 (a) or (b) to Yokohama.

Note.—Routes (c) and (d) are designed for vessels with a radius of action of less than 4,000 miles; the longest unbroken passage is 3,430 miles between Honolulu and Yokahama. Refuelling is possible at all three intermediate ports, though only fuel and diesel oil is available at Manzanillo, and coal can be obtained at San Diego only by previous arrangement, but other fuels stocks are ample at the latter port.

Distance from Panama to Yokohama by (a), 7,680 miles; by (b), 8,072 miles; by (c), 8,124 miles; by (d), 8,503 miles.

Route 840. Panama to Guam

Take Route 835 to Honolulu, and thence Route 609 to Guam. This route is recommended.

Note.—The direct Great Circle track from Panama to Guam is only about 25 miles less in distance than the above; it is beyond the radius of action of most vessels.

Distance from Panama to Guam by the recommended route, 8,013 miles.

Route 841. Panama to Shanghai, Hong Kong, Manila or Singapore.

The passage may be made via Honolulu and Yokohama, or via Honolulu and Guam. To Shanghai, or Hong Kong, the total distance is less via the former; to Manila, or Singapore, it is less via the latter. Nevertheless the route via Honolulu and Guam is recommended in each case, as better weather and a favourable, instead of an adverse, current can be expected.

(a) Via Honolulu and Yokohama.—Take Route 839 (b), (c) or (d) to Yokohama, and thence Route 752 (1) to Shanghai (Route 752 (2) to other ports in China), Route 751 to Hong Kong, Route 749 to Manila, or Route 750 to Singapore.

(b) Via Honolulu and Guam (Recommended route).—Take Route 840 to Guam (via Honolulu), and thence Route 666 to Shanghai, Route 667 to Hong Kong, Route 668 (1) to Manila, or Route 668 (2) to Singapore.

Distance from Panama to Shanghai by (a), 9,108 miles; by (b), 9,697 miles; to Hong Kong by (a), 9,656 miles; by (b), 9,813 miles; to Manila by (a), 9,828 miles; by (b), 9,510 miles; to Singapore by (a), 10,960 miles; by (b), 10,680 miles.

Route 842. Panama to Sydney

The direct route, 7,697 miles, is beyond the radius of action of many vessels; for these the route via Tahiti is recommended. Vessels with a very small bunker capacity would have to take passage via Manzanillo, San Diego, Honolulu, Apia and Suva.

(a) Direct route.—From a position in lat. 6° 20′ N., long. 80° 35′ W. at the entrance of Panama bay, steer on a Rhumb line to lat. 2° 10′ S., long. 90° 00′ W., about 50 miles southward of Archipielago de Colon (Islas Galápagos). From this point steer on a Great Circle to a position 30 miles south of Pitcairn island in lat. 25° 40′ S., long. 130° 00′ W., crossing the various meridians at the following latitudes:—

Long.	100° 00′ W.	at lat.	9° 40′ S.
,,	110° 00′ W.	,,	15° 30′ S.
,,	120° 00′ W.	,,	20° 50′ S.

and passing about 25 southward of Henderson island (100 feet (30^{m}5) high).

From the position south of Pitcairn island, steer on a Rhumb line to a position lat. 30° 00′ S., long. 150° 00′ W., passing about 30 miles southward of Marotiri (346 feet (105^{m}5) high) (*see* Pacific Islands Pilot, Vol. III), or 70 miles southward of Rapa island.

From lat. 30° 00′ S., long. 150° 00′ W., steer to pass about 5 miles northward of the Three Kings islands, lying 32 miles north-westward of Cape Maria van Diemen, North island, New Zealand, crossing the intervening meridians at the following latitudes:—

Long.	155° 00′ W.	at lat.	31° 20′ S.
,,	160° 00′ W.	,,	32° 20′ S.
,,	165° 00′ W.	,,	33° 00′ S.
,,	170° 00′ W.	,,	33° 30′ S.
,,	175° 00′ W.	,,	33° 50′ S.
,,	180° 00′	,,	34° 00′ S.

From the position off Three Kings islands take a Rhumb line track direct to Sydney.

(b) Via Tahiti.—Take Route 836 to Tahiti, and thence Route 624 (3) to Sydney. *See* Notes under Route 502.

(c) Via Manzanillo, San Diego, Honolulu, Apia, and Suva.—Take Route 838 (c) to Suva, and thence Route 654 (3) to Sydney.

Distance from Panama to Sydney by (a), 7,697 miles; by (b), 7,874 miles; by (c), 9,761 miles.

Note.—Intermediate distances on (a) are: Panama to position off Pitcairn island, 3,639 miles; thence to position on 150th meridian, 1,092 miles; thence to Three Kings islands, 1,879 miles; thence to Sydney, 1,087 miles.

Route 843. Panama to New Zealand ports.

(a) Direct route.—Take Route 842 (a) as far as Pitcairn island in lat. 25° 40′ S., long. 130° 00′ W., and thence take another Great Circle to a position in lat. 36° 30′ S., long. 160° 00′ W., passing through lat. 30° 10′ S., long. 140° 00′ W., and lat. 33° 50′ S., long. 150° 00′ W.

From the position on the 160th meridian, take a further Great Circle track direct to destination.

(b) Via Tahiti.—Take Route 836 to Tahiti *(see* Note under that route) and thence take a Great Circle track to destination (Route 623).

Distance from Panama to Auckland by (a), 6,550 miles; by (b), 6,785 miles; to Wellington, by (a), 6,508 miles; by (b), 6,918 miles; to Port Chalmers by (a), 6,731 miles; by (b), 7,173 miles.

Note.—Intermediate distances in (a) are:—Panama to position off Pitcairn island, 3,639 miles; thence to position on 160th meridian, 1,664 miles.

See Note under Route 593 (2) (a), regarding the direct Great Circle track between Wellington and Panama.

Route 844. Panama to western ports of South America.

In all cases take as direct a route as navigation permits. A contrary current up to about 25 miles a day will be felt throughout the whole voyage.

Distance from Panama to Callao, 1,340 miles; to Iquique, 1,980 miles; to Valparaiso, 2,615 miles; to Estrecho de Magallanes (Cabo Pilar), 3,732 miles.

Route 845.—*Reserved as spare.*

Route 846.—*Reserved as spare.*

(viii) ROUTES FROM CALLAO

Route 847. Callao to Panama

Proceed as directly as navigation permits.

Distance from Callao to Panama, 1,340 miles.

Route 848. Callao to Manzanillo

Take a Rhumb line track direct.

Distance from Callao to Manzanillo, 2,471 miles.

Route 849. Callao to San Diego or San Francisco

First proceed on a Rhumb line track to a position in lat, 26° 40′ N., long. 115° 00′ W., passing eastward of Archipielago de Colon (Islas Galápagos). From this point, if bound to San Diego, first steer to lat. 30° 00′ N., long. 117° 30′ W., and thence direct to destination; if bound to San Francisco, steer northwards at about 40 miles distance from the coast to destination.

Distance from Callao to San Diego, 3,581 miles; to San Francisco, 3,988 miles.

Note.—Passage may also be made via Manzanillo. *See* Routes 848 and 824. In this case the total distance is 3,599 miles to San Diego, or 4,006 miles to San Francisco.

Route 850. Callao to Honolulu

Take a Great Circle track direct.

Distance from Callao to Honolulu, 5,157 miles.

Note.—For vessels with a limited radius of action the passage may be made via Manzanillo (Routes 848 and 825; Distance 5,487 miles) or via San Diego (Routes 849 and 813; Distance, 5,856 miles).

Fuel.—Only fuel and diesel oil can be obtained at Manzanillo; both can be obtained at San Diego, while coal is available by special arrangement.

Route 851. Callao to Tahiti

Passage may be made northward of Disappointment islands, or southward of Ahunui, Archipel des Tuamotu; the latter is about 135 miles less than the former, but the navigational difficulties are increased.

(a) Northern route.—Take a Great Circle track to a position in lat. 14° 00′ S., long. 141° 22′ W., northward of Tepoto, Disappointment island. Thence proceed along the northern side of Archipel des Tuamotu, round Matahiva, and thence direct to Tahiti.

(b) Southern route.—Take a Great Circle track to a position in lat. 19° 46′ S., long. 140° 26′ W., south-eastward of Ahunui, and thence proceed direct to Tahiti.

Distance from Callao to Tahiti by (a), 4,350 miles; by (b), 4,216 miles.

Route 852. Callao to Apia and Suva

(a) Direct route.—Take Route 851 (b) to a position in lat. 19° 46′ S., 140° 26′ W., south-eastward of Ahunui, Archipel des Tuamotu, and thence, if bound to Apia, take a second Great Circle direct to that port; if bound to Suva, take Rhumb line tracks first to lat. 18° 48′ S., long. 159° 43′ W., north of Aitutaki, and thence direct to Nanuku passage, Fiji islands.

(b) Via Tahiti.—Take Route 851 (a) or (b) to Tahiti, and thence Route 622 (3) to Apia, or Route 622 (4) to Suva.

Distance from Callao to Apia by (a), 5,494 miles; by (b), using 851 (a), 5,655 miles; by (b), using 851 (b), 5,521 miles; to Suva, by (a), 6,040 miles; by (b), using 851 (a), 6,215 miles; by (b), using 851 (b), 6,081 miles.

Route 853. Callao to Sydney

(a) Direct route.—Steer first on a Great Circle to a position in lat. 30° 00′ S., long. 120° 00′ W., passing about 40 miles northward of the island of Sala y Gomez, and half that distance northward of Easter island. From long. 120° 00′ W., steer along the parallel of 30° 00′ S., to long. 150° 00′ W., to join Route 842 (a), Panama to Sydney.

(b) Via Tahiti.—Take Route 851 (a) or (b) to Tahiti, and thence proceed on a Great Circle track direct to Sydney. *See* Notes under Route 502.

Distance from Callao to Sydney by (a), 7,129 miles; by (b), using 851 (a), 7,654 miles.

Route 854. Callao to New Zealand ports

(a) Direct route.—Take Route 853 (a) as far as lat. 30° 00′ S., long. 120° 00′ W., and thence steer to a position in lat. 30° 10′ S., long. 140° 00′ W., to join Route 843 (a), Panama to New Zealand ports.

(b) Via Tahiti.—Take Route 851 (a) or (b) to Tahiti, and thence proceed on a Great Circle track to destination.

Distance from Callao (using Route 851 (a) in (b) above) to Auckland by (a), 5,961 miles; by (b), 6,565 miles; to Wellington by (a), 5,919 miles; by (b), 6,698 miles; to Port Chalmers by (a), 6,142 miles; by (b), 6,953 miles.

Route 855. Callao, southward, to ports on west coast of South America

Proceed as directly as navigation permits. A contrary current will be experienced throughout the entire voyage.

Distance from Callao to Iquique, 646 miles; to Valparaiso, 1,299 miles; to Estrecho de Magallanes (Cabo Pilar), 2,453 miles.

See Note under Route 805.

Note.—The distance from Cabo Pilar, through Estrecho de Magallanes, to Dungeness is 310 miles. For Routes onward to ports in the Atlantic ocean, *see* Part I, Chapter III.

(ix) ROUTES FROM IQUIQUE

Route 856. Iquique, northward, to ports on west coast of America

In each case proceed by Rhumb line tracks as directly as navigation permits. *See* Routes 848 and 849.

Distance from Iquique to Acapulco, 2,835 miles; to Callao, 646 miles; to Manzanillo, 3,105 miles; to Panama, 1,980 miles; to San Diego, 4,213 miles; to San Francisco, 4,620 miles.

Route 857. Iquique to Tahiti

Take the Great Circle track to Pitcairn island passing close to the northward of the island Sala y Gomez. From Pitcairn, proceed as directly as navigation permits, passing southward of all the islands of the Archipel des Tuamotu.

This route is about 65 miles longer than the direct Great Circle track, but avoids navigation among the scattered islands of the Archipel des Tuamotu.

Distance from Iquique to Tahiti, 4,547 miles.

Route 858. Iquique to Honolulu

Take a Great Circle track direct.

Distance from Iquique to Honolulu, 5,716 miles.

Note.—For vessels of moderate bunker capacity the passage may be made via Manzanillo. The total distance is 6,121 miles, the longest run being 3,105 miles to Manzanillo.

Route 859. Iquique to Australian or New Zealand ports

(a) Direct route.—Take a Great Circle track to a position in lat. 30° 00′ S., long. 120° 00′ W., to join Route 853 (a), Callao to Sydney, or Route 854 (a), Callao to New Zealand ports.

(b) Via Tahiti.—Take Route 857 to Tahiti. From Tahiti take Route 853 (b) to Sydney or 854 (b) to New Zealand.

Distance from Iquique to Sydney by (a), 7,275 miles; by (b), 7,851 miles; to Auckland, by (a), 6,107 miles; by (b), 6,762 miles; to Wellington, by (a), 6,065 miles; by (b), 6,895 miles; to Port Chalmers, by (a), 6,288 miles; by (b), 7,150 miles.

Note.—The passage to Sydney may be made via Wellington if desired. The distance is slightly more than the direct route, namely, 7,298 miles.

Route 860. Iquique, southward, to ports in South America

Proceed as directly as navigation permits. A contrary current will be experienced throughout the whole voyage.

Distance from Iquique to Valparaiso, 780 miles; to Estrecho de Magallanes (Cabo Pilar), 1,987 miles.

Notes.—The distance from Cabo Pilar, through Estrecho de Magallanes, to Dungeness is 310 miles.

For routes from Estrecho de Magallanes to Atlantic ports see Section B., Part I., Chapter III.

Routes to ports on Asiatic mainland should be taken via Tahiti or Honolulu. See Routes 857 and 858.

Route 861.—*Reserved as spare.*

See Section D. Part III. Index on pages 357 and 358.

(x) ROUTES FROM VALPARAISO

Route 862. Valparaiso to Callao

Make the passage either on a Rhumb line track direct or along the coast, the former being about 120 miles less than the latter. A favourable current will be carried.

Distance from Valparaiso to Callao, 1,299 miles.

Route 863. Valparaiso to Panama

Proceed via Callao, calling at that port if necessary. The difference in the direct route and a call at Callao is only 24 miles.

Distance from Valparaiso to Panama direct 2,615 miles; via Callao, 2,639 miles.

Route 864. Valparaiso to Manzanillo

(a) Direct Route.—Take a Great Circle track direct, passing west of Archipielago de Colon (Islas Galápagos).

(b) Via Callao.—Take Route 862 to Callao and thence proceed on a Rhumb line track direct (Route 848).

Distance from Valparaiso to Manzanillo by (a), 3,652 miles; by (b), 3,770 miles.

Route 865. Valparaiso to San Diego or San Francisco

(a) Direct route.—Take the reverse of Route 820 (a) to San Diego, or of Route 805 (a) to San Francisco.

(b) Via Callao and Manzanillo.—Take Route 864 (b) to Manzanillo, and thence Route 824 to either destination.

Distance from Valparaiso to San Diego by (a), 4,733 miles; by (b), 4,898 miles; to San Francisco by (a), 5,140 miles; by (b), 5,305 miles.

Route 866. Valparaiso to Honolulu

Take a Great Circle track direct.

Distance from Valparaiso to Honolulu, 5,912 miles.

Note.—Vessels with a limited bunker capacity can make the voyage via Manzanillo (Route 864 (b)) or via San Diego (Route 865 (b)).

Route 867. Valparaiso to Tahiti

Take the reverse of Route 620 (2), proceeding on a Great Circle to a position southward of Duke of Gloucester group, and thence south of Hereheretue to Tahiti as directly as navigation permits.

Distance from Valparaiso to Tahiti, 4,256 miles.

Route 868. Valparaiso to Australian or New Zealand ports

(a) Direct route.—Take a Great Circle track to a position in lat. 30° 00′ S., long. 120° 00′ W., to join Route 853 (a), Callao to Sydney, or Route 854 (a), Callao to New Zealand ports.

(b) Via Tahiti.—Take Route 867 to Tahiti, and thence take Route 853 (b) to Sydney, or Route 854 (b) to New Zealand ports.

Distance from Valparaiso to Sydney by (a), 6,984 miles; by (b), 7,560 miles; to Auckland by (a), 5,816 miles; by (b), 6,471 miles; to Wellington by (a), 5,774 miles; by (b), 6,604 miles; to Port Chalmers by (a), 5,997 miles; by (b), 6,859 miles.

Note.—The passage to Sydney may be made via Wellington with little difference in distance. *Total distance*, 7,007 miles.

Route 869. Valparaiso to Estrecho de Magallanes (Cabo Pilar)

Proceed along the coast as directly as navigation and weather permit.

Distance from Valparaiso to Cabo Pilar, 1,224 miles.

Note.—The distance from Cabo Pilar, through Estrecho de Magallanes, to Dungeness is 310 miles.

For routes from Estrecho de Magallanes to Atlantic ports see Section B., Part I, Chapter III.

Passage to ports on the Asiatic mainland, Singapore, or Japan should be taken via Honolulu (Route 866*), or via Tahiti (Route* 867).

Route 870.—*Reserved as spare.*

Route 871.—*Reserved as spare.*

(xi) ROUTES FROM ESTRECHO DE MAGALLANES (MAGELLAN STRAIT)

For routes from Estrecho de Magallanes to Atlantic ports see Section B., Part I, Chapter III.

The distance from Cabo Pilar, through Estrecho de Magallanes, to Dungeness is 310 *miles.*

Route 872. Estrecho de Magallanes (Cabo Pilar) to ports on west coast of America

(1) To SAN FRANCISCO, SAN DIEGO or MANZANILLO.—There is a direct and an alternative (coastal) route in each case; the details of these are given in Routes 806, 821, and 832, from San Francisco, San Diego, and Manzanillo, respectively. The reverse of these routes should be taken.

Distances from Estrecho de Magallanes to the above ports are as given in Routes 806, 821, and 832.

(2) To PANAMA and PORTS TO THE SOUTHWARD.—In all cases the route is as direct as navigation will permit, but a course may be set along the coast if desired, calling at intermediate ports. In both cases a favourable current will be carried.

The distances are as given in Routes 844 (Panama), 855 (Callao), 860 (Iquique), 869 (Valparaiso).

Route 873. Estrecho de Magallanes to Honolulu

(a) Direct route.—Take a Great Circle track direct.

(b) Via Tahiti.—Take Route 874 to Tahiti, and thence Route 621 to Honolulu.

Distance from Estrecho de Magallanes to Honolulu by (a), 6,170 miles; by (b), 6,411 miles.

Route 874. Estrecho de Magallanes to Tahiti

Take a Great Circle track direct.

Distance from Estrecho de Magallanes to Tahiti, 4,031 miles.

Route 875. Estrecho de Magallanes to Sydney

Take a Great Circle track to a position in lat. 30° 00′ S., long. 140° 00′ W.; thence steer along the parallel of 30° 00′ S. to long. 150° 00′ W., to join Route 842 (a), Panama to Sydney.

Distance from Estrecho de Magallanes to Sydney, 6,600 miles.

Route 876. Estrecho de Magallanes to New Zealand ports

Take a Great Circle track to a position in lat. 30° 10′ S., long. 140° 00′ W., to join Route 843 (a), Panama to New Zealand ports.

Distance from Estrecho de Magallanes to Auckland, 5,424 miles; to Wellington, 5,382 miles; to Port Chalmers, 5,605 miles.

Passage to ports on the Asiatic mainland, Singapore, Japan, or other islands in the Pacific other than Honolulu should be made via Tahiti.

Routes 877 to 999.—*Reserved as spare.*

See Section D. Part III. Index on pages 357 and 358.

END OF STEAMSHIP ROUTES

Section B

STEAMSHIP ROUTES

Route Index

This index is designed to enable the mariner to see at a glance whether, and where, a description of the steamship route from any port, island, etc. to any other port, island, etc. is to be found in this section of the book. The lay-out of the index is as follows:—

In the left-hand column, the names of the ports, etc., *from which* routes are described, are printed in **bold** type in alphabetical order. In the same column, offset from each port, is an alphabetical list of all ports, etc. *to which* routes are described in the text of the book. The number of the route, and the page on which it will be found, follow in the next two columns.

Example:—

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Africa, West coast of	47	49
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etc. etc.		
Black sea		
etc.		

When a destination port, etc. is not mentioned in the title of the route as printed in the text, it is shown in *italics* in the Index. Italics are used also where a route passes close to a port or island which is not specifically mentioned in that route, but which is still of sufficient importance to justify a note in the index. In the above example " West coast of Africa " appears in the title of Route 47 while " Accra " does not; the latter is printed therefore in *italics*.

In a few cases the port of departure is printed in *italics*. This indicates that no route title appears under the name of such port, but that a through-route passes sufficiently close to justify its inclusion in the index, e.g. *Açôres Arquipélago dos*. The offset names (*also in italics*) in this case are the destinations in the route in column 2.

A

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Section C

SAILING-SHIP ROUTES

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SECTION C

INTRODUCTORY REMARKS

The sailing-ship routes given in this Section have been arranged in three Parts, I, II and III, according to oceans, in a similar manner to the steam-ship routes of Section B, and are limited to those between the principal ports of the world nowadays visited by sailing-vessels. The Mediterranean, however, is included in Chapter I of Part I instead of as a separate part as in Section B.

The routes are mostly confined to those between ports situated in the same ocean; but as sailing vessels constantly make long-distance voyages from ocean to ocean, without calling at an intermediate port, routes have been included for rounding South Africa, Tasmania and Cape Horn, respectively. Continuous voyages to and from the China sea, through the various straits and passages of the Sunda islands and through the Eastern archipelago are also provided for.

Coastal voyages and many others which, since the advent and growth of steam-ship traffic are seldom or never undertaken by sailing-ships, have been omitted. So, also, have been routes for sailing-vessels having auxiliary motor or steam power, or steam or motor vessels with auxiliary sails. Nevertheless these vessels can obtain considerable assistance in planning their routes by a careful study of the following information to be found elsewhere in this book, or in other Admiralty publications or charts:—

(a) Winds and weather, and currents in Section A, and in Chapter I of each part of Section B.

(b) The routes described in Section B, especially those for low-powered vessels.

(c) The sailing-ship route in this section to some port in the same region as that to which the auxiliary-vessel is bound.

(d) The Admiralty Sailing Directions for the area to which, or through which, the vessel will proceed. *See* Chart Y in the pocket at the end of this book.

(e) Chart 5309, " Tracks followed by sailing and low-powered steam vessels " (not included in this volume), on which are plotted many routes in more detail than on Chart 5308 to be found in the pocket at the end of this book.

It must be stressed, however, that the routes described in this section are for large sailing-vessels able to stand up to, and take advantage of, the heavy weather to be expected on many of the passages, e.g.: The Roaring Forties of the Southern ocean.

The great Southern ocean, which offers the only direct water-route around the globe, may be considered as *the main track of sailing-ships*, on account of the strong westerly winds which there prevail, and may be depended upon at all seasons of the year to afford a swift passage, unimpeded by dangers.

Therefore the voyage of a sailing-vessel, from her port of departure to her return home, is as a rule, around the world, before the wind, *to the eastward.* In the routes given herein, however, provision is made for voyages in the contrary direction, as, for example, from Cape Town to the River Plate, or to New York; from Australian ports across the Indian ocean to Durban; or from Valparaiso westward across the Pacific ocean to New Zealand.

The greater part of the sailing directions for each route has been condensed, or copied verbatim from the Admiralty Sailing Directions for all oceans and coasts, and much of this information is derived from the navigating notes of naval and merchant officers of days before steam-ships had come into general use. It would be very desirable, consequently, if modern additions and corrections should be made to these directions, and sailing-masters are requested to forward such information to the Hydrographer, Admiralty, Whitehall, London, S.W., for this purpose.

In the first edition, the sailing routes plotted on the map of the world in the pocket at the end of the book represented, in condensed form, information from several sources. Chief among these was the plotting of about 100 tracks of actual voyages made, in the years previous to the first edition between various ports, on trips around the world, made by the vessels of Messrs. Hardie and Company, of Glasgow, who kindly supplied the track-charts on which they were shown. The averages thence derived were combined with the recommended tracks, for different seasons of the year, shown on the Pilot charts of the British Meteorological Office for the Atlantic and Indian oceans, and with those shown on the Pilot charts for all oceans, and all seasons of the year, issued by the Hydrographic Office of the United States Navy Department.

It was not possible, without causing confusion, to plot every sailing voyage described in the text of the book; but the general, and principal routes were shown on the map. The map is retained practically unaltered in this, the second, edition.

In the sailing directions given under each route special reference is made, where necessary, and cautions given respecting winds, currents, fogs, etc. likely to be encountered; but the navigator should, without fail, make himself acquainted with the general oceanic winds and currents to be expected on any voyage, besides those referred to in the route, such as are described in Section A, and in Section B (Parts I, II, III and IV) of this book and shown in the chart (5310) of ocean currents in the pocket at the end.

The introductory remarks on page 7 should also be studied, in which the general scope of the whole book is explained, and also the method of arrangement of information concerning Winds and Currents, and Routes (both steam-ship and sailing-ship) is set forth.

As regards distances traversed on a sailing voyage between any two ports, it is considered that this could be more profitably expressed in the average number of days that would be taken, in ordinary weather, by a well-found ship of about 2,000 tons burthen; the type of ship, namely, for which the routes themselves have been framed. The following list of length, in days, of sailing voyages between some of the principal ports of the world, is therefore appended. It has kindly been supplied by the same firm of sailing-ship owners mentioned above, in connection with sailing tracks around the world, Messrs. Hardie and Company, of Glasgow.

AVERAGE NUMBER OF DAYS, IN NORMAL WEATHER, TAKEN IN MAKING A SAILING PASSAGE BETWEEN THE FOLLOWING PORTS.

	Number of days
Channel to New York, winter months	35–40
Channel to New York, summer months	40–50
Channel to New Orleans	45–55
Channel to Rio de Janeiro or Pôrto de Santos	45–60
Channel to Rio de La Plata	55–65
Channel to Valparaiso (around Cabo de Hornos) (Cape Horn)	90–100
Channel to Callao (around Cabo de Hornos)	95–120
Channel to San Francisco (around Cabo de Hornos)	125–150
Channel to Cape Town	50–60
Channel to Durban	60–65
Channel to Bombay	100–110
Channel to Calcutta	100–120
Channel to Rangoon	100–120
Channel to Soenda straat (Sunda strait)	90–100
Channel to Hong Kong (south-west monsoon)	100–120
Channel to Adelaide	80–90
Channel to Melbourne	80–90
Channel to Sydney (or Newcastle)	85–100
New York to Channel	25–30
New York to Cape Town	65–70
New York to Rio de La Plata	60–65
New York to Melbourne	100–120
New York to Soenda straat (Sunda strait)	100–110
Cape Town to Melbourne	35–40
Cape Town to Wellington	40–45
Cape Town to Rio de La Plata (across the Atlantic)	45
Cape Town to Rio de La Plata (around Cabo de Hornos) (Cape Horn)	110
Cape Town to Calcutta	40–50
Cape Town to Shanghai (via Soenda straat, south-west monsoon)	60
Calcutta to Sydney	60
Calcutta to Cape Town	45
Calcutta to Channel	90–100
Hong Kong to Channel (north-east monsoon)	110–120
Hong Kong to San Francisco	40
Hong Kong to Sydney	50–60
Melbourne to Valparaiso	40–50
Melbourne to San Francisco	60–70
Melbourne to Rio de La Plata (around Cabo de Hornos)	70–80
Melbourne to Channel (around Cabo de Hornos)	80–100
Melbourne to Hampton Roads	80–95
Wellington to San Francisco	60–70
Wellington to Valparaiso	30–35
Wellington to Rio de La Plata	55–60
Wellington to Channel	80–100
Valparaiso to Channel (around Cabo de Hornos)	80–90
Valparaiso to New York (around Cabo de Hornos)	75–85
Valparaiso to Cape Town	65
Rio de La Plata to Channel	70–80
Rio de La Plata to New York	60–70
Rio de La Plata to Cape Town	20
Rio de La Plata to Melbourne	50–55
New Orleans to Channel	45–50

PART I

ATLANTIC OCEAN AND MEDITERRANEAN

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Notes

The general Sailing-ship index will be found at the end of the whole of Section C., commencing on page 321

The Winds and Weather, Currents and Ice of the Atlantic ocean and Mediterranean sea are described in Chapter I. of Section B., Parts I. and II.

SECTION C. PART I.

Chapter I

SAILING-SHIP ROUTES FROM PORTS ON THE EASTERN SIDE OF ATLANTIC OCEAN AND IN THE MEDITERRANEAN SEA

(i) ROUTES FROM PORTS IN WESTERN EUROPE

Route 1,000. Norway or ports in the Baltic, to ports in the Atlantic ocean

(1) To Newfoundland, Canada, and Eastern ports of the United States.—There are two main routes, Northern and Southern, and also a direct route. The Northern route should, as a rule, only be taken in autumn, when it is clear of ice.

(a) The Northern route.—Pass northward of the Orkneys, or of the Shetlands if the weather necessitates that course. Thence stand westward to cross the meridian of 30° W. in about lat. 55° N., and join Route 1,004 (a) from the Channel.

(b) The Southern route.—Pass round the Orkneys or the Shetlands as in (a), and then stand westward to ensure weathering the west coasts of Scotland and Ireland with sufficient sea-room in the prevailing westerly winds. Then stand southward to join Route 1,004 (b) in about lat. 40° N., long. 17° W.

(c) The Direct route.—This route is seldom taken as it is almost directly against the prevailing winds, the North Atlantic current and the Gulf stream.

Having rounded the Orkneys or Shetlands as in (a), make westward to at least long. 10° W., and thence south-westward to join Route 1,004 (c) in about lat. 47° N., long. 40° W.

(2) To other ports in the Atlantic; round Cabo de hornos (Cape Horn) or round the Cape of Good Hope.—Proceed as in (1) (b) above to join the appropriate route from the Channel in about lat. 40° N. *See* Routes 1,005, 1,006, 1,007 and 1,009.

Route 1,001. North sea ports in the United Kingdom, Denmark, Germany, Holland or Belgium to ports in the Atlantic ocean.

(1) To Newfoundland, Canada and Eastern ports of the United States.—There are three routes as in Route 1,000 above. On the Northern route with westerly winds in summer a vessel will probably do better by going " north about " round the Orkneys to join Route 1,000, than by beating down the Channel. On the Southern and Direct routes the latter is preferable, the ensuing passage being as described in Route 1,004 (b) or (c).

(2) To other ports in the Atlantic; round Cabo de Hornos (Cape Horn); or round the Cape of Good Hope.—After passing down the Channel take the appropriate route as described in Routes 1,005, 1,006, 1,007 and 1,009.

Route 1,002. Irish sea and the Clyde to ports in the Atlantic ocean

If taking the Northern or Direct routes to Newfoundland, Canada or the United States when bound from Liverpool or the Clyde, it is generally better to pass north of Ireland with westerly winds in summer. On the Southern route, and on the routes to other ports the weather conditions at the time of sailing will determine the most advantageous course to join the Routes from the Channel described below.

Route 1,003.—*Reserved as spare.*

Route 1,004. Channel to Newfoundland, Canada and eastern ports of the United States

There are two principal routes, a Northern, and a Southern, and also a direct route. The Northern route should, as a rule, only be taken in autumn, when it is free from ice.

(a) The Northern route.—In this route, although heavy weather is frequently experienced, the winds are generally more favourable, and the currents from the Arctic assist in the latter part of the voyage.

When clear of the British Isles stand westward and cross the meridian of 30° W. in about lat. 55° N.; then steer, according to destination, for the Strait of Belle isle, for St. John's or for Canadian or United States ports.

Bound for the Gulf of St. Lawrence or Halifax, either endeavour to make Cape Race by passing north of the Virgin rocks, or, in order to avoid the ice, cross the banks on the parallel of 44° N., and haul up on the proper course on reaching long. 55° W., heavy ice being seldom met with westward of that meridian.

Bound westward of Cape Race, pass south-eastward of that cape, making it if the weather is clear, and thence steer for a position southward of St. Pierre island. While on the Great bank of Newfoundland during fog, or when there is uncertainty regarding the position, soundings should be obtained frequently, and an indraught towards the south coast of Newfoundland guarded against.

Notes.—The south coast of Newfoundland, eastward of Cape Ray, is broken, rocky and dangerous, and the tidal streams are influenced by the winds. Southerly and easterly winds, and often also south-westerly winds, bring a thick fog, which is most dense near the lee shore. This coast therefore should not be approached, excepting with a decidedly northerly wind and clear weather.

Sable island should be given a wide berth, as it is a very dangerous locality owing to the prevalent fogs and variable currents near it. Sounding should never be neglected in crossing the banks, and should be continuous whether bound for a Nova Scotia or a United States port. In thick weather, the thermometer is also a useful guide in approaching the banks of Newfoundland, as the temperature of the water falls on nearing them.

With south-westerly winds, while foggy eastward of the meridian of Flint island, Cape Breton island, it is frequently clear for some miles off the land westward of it.

Between St. Pierre, and Cape Breton island, when feeling the way by sounding, in foggy weather, the edges of the deep water channel running through the banks into Cabot strait are especially good guides. Cape Pine should not be approached to less than 40 fathoms ($73^{m}1$) nor Cape St. Mary, than 50 fathoms ($91^{m}4$) in fog. There is deep water of 100 to 142 fathoms ($182^{m}9$ to $259^{m}7$) in the approach to Placentia bay.

See Section D. Part I. Index on pages 340 and 341.

CAUTION. All this portion of the sea, from the eastern limit of the Bank of Newfoundland, past Cape Race to Halifax, as well as to Portland, Boston, or other harbours of the coast of the United States, is within the limit of soundings, and therefore during foggy weather, or when in doubt respecting the ship's position, frequent use should be made of this circumstance. It is to the neglect of this absolutely necessary precaution, no less than to the fogs and irregular currents, that the many shipwrecks on Sable island and the south-east coast of Nova Scotia are attributable.

See Newfoundland Pilot, Vols. I and II, Nova Scotia, and St. Lawrence Pilots, and East Coast of United States Pilot, Vols. I and II, for further details of fog and ice in these waters. *See also* Section B., Part I, Chapter I.

(b) The Southern route.—This is the best route to be followed during the whole of the year excepting the autumn months, on account of the better weather likely to be experienced, the certainty of the wind, and the avoidance of both fog and ice off the Newfoundland Banks, during the spring and early part of the summer months.

By this route, leaving the Channel with a fair wind steer a direct course as long as it lasts, and at least ensure sufficient westing to avoid the danger of being set into the Bay of Biscay. When the fair wind fails, take the Madeira route (see Route 1,007 (1)), and if the wind permits pass midway between it and the Arquipélago dos Açôres into the North-East Trade wind, but if the wind does not favour, the trade wind will usually be gained sooner by passing nearer to Madeira. In that neighbourhood, it is usually found in the summer season between lats. 32° and 31° N.; in winter, a degree or so farther south.

If bound for Halifax, or Canadian ports.—When well within the trade wind limits, run westward until in about long. 48° W., and thence edge off to the north-westward, passing about 200 miles eastward of Bermuda, and direct for Halifax, allowing for the Gulf stream setting to the east-north-eastward across the track. The colour of the Gulf stream is a deep indigo blue, and the junction with ordinary sea water, on its northern edge, is distinctly marked. On crossing the northern limit of the stream the temperature of the sea has been observed to fall as much as 30° Fahr.

If bound for New York, or other United States ports.—When well into the trade wind limits, run westward, keeping southward of lat. 25° N. until in about long. 65° W.; then steer north-westward for any United States port, hauling out rather earlier for the northern ports and rather later for southern ports.

Note the above remarks as to the Gulf stream, which will have to be crossed in the latter part of this route.

(c) The Direct route.—This route across the Atlantic, from the Channel to Boston or New York, which is about 1,000 miles shorter than the Southern Route, can seldom be taken on account of the prevailing westerly winds, and of the North Atlantic current and Gulf stream combined, running contrary to the desired track. It is, however, recommended by some navigators, making as directly as possible from the Channel, to cross long. 50° W. at lat. 45° N., and thence to the desired port. Leaving with an easterly wind it may be found a better way to steer West, and if the wind should veer by the south towards the west, to continue on the port tack, until by changing, the vessel could lie its course. If the wind should continue to veer to the northward, and as it sometimes does to the eastward of north, a vessel on the starboard tack might be allowed to head to the westward of the direct course; on both tacks she would have sailed on curved lines, the object of which would be to carry her to the westward against the prevailing winds and currents.

Route 1,005. Channel to Bermuda

(a) Direct route.—Proceed generally as described in Route 1,004 (c).

(b) Southern route.—Proceed as in Route 1,007 (1) as far as Madeira, and thence steer to the south-westward until within the northern limit of the North-East Trade wind (which will be entered when the sun is in the northern tropic between the parallels of 31° and 32° N., and when it is near the southern tropic between those of 30° and 31° N.), when the course should be altered gradually to the westward, keeping within the limit of the trade wind. Cross the meridian of 40° W. in lat. 25° N., which parallel should be preserved until the meridian of 60° W. is reached, when a course for Bermuda may be steered.

CAUTION. When approaching the islands every opportunity should be taken to verify the vessel's position, and should it be at all doubtful and the weather unfavourable for seeing the lights, the parallel of the islands should not be crossed during the night, for the 100-fathoms (182^{m}9) contour line is too close to the reef for soundings to give warning.

Route 1,006. Channel to West Indies, Gulf of Mexico and the Spanish Main.

First take Route 1,007 (1) as far as Madeira. After passing Madeira endeavour to cross the parallel of 25° N. in from 25° to 30° W. long., the object being to reach the North-East Trade wind as soon as possible. The season of the year must be taken into consideration, as to how far south it will be necessary to go to insure holding the trade wind. Continue as follows:—

(1) To CUBA.—Bound to Habana or Puerto Matanzas pass through the North-west Providence channel close along the western edge of the Great Bahama bank, round the elbow of Double-headed Shot cays, Cay Sal bank, and across towards Punta Guanos, on the western side of Matanzas, out of the stream. The Old Bahama channel may also be used or, if approaching from the westward, Cabo San Antonio may be rounded.

Bound to any port on the south side of Cuba, it is better to pass northward of Puerto Rico and Santo Domingo-Haiti during the period of southerly winds, which is the rainy season, and southward of these islands when north winds are prevalent.

(2) To THE LEEWARD ISLANDS, JAMAICA, BELIZE, or to PORTS IN THE GULF OF MEXICO.—Cross the 40th meridian W. in about lat. 18° N., and thence steer direct to pass between Antigua and Guadaloupe; thence pass close southward of Haiti and Jamaica, and thence continue nearly direct.

Notes.—The channel between Antigua and Guadeloupe islands is 30 miles wide, and there is generally much less current here than farther north or south. It will be better, however, in using this channel, to keep the Antigua shore on board, and to sight the island on the parallel of lat. 17° N. Vessels sometimes pass between Antigua and Barbuda islands; this may be done without much risk in the daytime, but by no means in the night, for the soundings are so irregular that in running down it would be difficult to tell whether to haul northward or southward.

To ports in the Gulf of Mexico, the North-West Providence channel is used by a great number of vessels, keeping on the edges of the banks, to avoid the strength of the current. The Old Bahama channel is also used, but less commonly.

(3) To THE SPANISH MAIN, TRINIDAD, and THE GUIANAS.

For the Venezuelan, Colombian, and Central American ports, as far westward as San Juan del Norte (Greytown) (*Lat. 10° 55′ N., Long. 83° 42′ W.*), cross the meridian of 40° W. in about lat. 13° N.; thence steer direct to the north-east extreme of

Trinidad and thence westward to the desired port, keeping in the strength of the prevailing westerly current.

For the islands northward of Trinidad, the season of the year must be considered as to how far south it will be necessary to go to insure holding the trade wind. In making for any of the Windward islands get in the parallel of the island about 100 miles to the eastward of it.

For Cayenne, cross the meridian of 40° W. in lat. 9° N.; thence steering to make the parallel of the port from 100 to 200 miles to windward, to allow for the strong westerly current which prevails at all seasons, thence gradually closing the shore in depths of 7 to 10 fathoms ($12^{m}8$ to $18^{m}3$).

For Surinam and Demerara, cross the meridian of 40° W. in from lat. 11° to 12° N., and thence steer to make the land to windward as for Cayenne.

Demerara is 4,100 miles, and Trinidad island 4,280 miles from Plymouth by this route.

See West Indies Pilot, Vols. I, II, and III, for details of the Winds, Weather and Currents prevalent on the latter part of these routes.

Route 1,007. Channel to South America and round Cabo de Hornos (Cape Horn)

(1) CHANNEL TO ARQUIPÉLAGO DE CABO VERDE (CAPE VERDE ISLANDS).—On leaving the English channel at once make westing, as the prevailing winds are from that direction. With a fair wind from the Lizard, steer a west-south-westerly course to gain an offing in long. 10° or 12° W.

If the wind should be from the westward keep on the tack which enables most westing to be made to get a good offing, and keep clear of the Bay of Biscay, even standing to the north-westward until well able to weather Cabo Finisterre on the starboard tack. By making a long board to the westward nothing is lost, as the wind will generally be found to veer, so that a change of wind will be favourable, and even permit a vessel to pursue a course with a free wind; whilst if embayed in the Bay of Biscay, any change of wind to the westward would necessitate beating to windward against the current.

It must be borne in mind that the prevailing winds and currents have a tendency to set towards Ushant, and into the Bay of Biscay when southward of it. To get well to the westward is therefore of the greatest importance. Ushant should, in no case, be sighted.

From long. 10° or 12° W., shape course to pass Madeira at any convenient distance, giving a wide berth to Cabo Finisterre, in passing it, as the current from the Atlantic usually sets right on-shore there. In the winter months it is preferable to pass westward of Madeira, for the strong westerly gales which occur in November, December and January, produce eddy winds and heavy squalls eastward of the island.

From Madeira the best track is to pass to the westward and just in sight of Arquipélago de Cabo Verde (Cape Verde islands) as the winds are stronger and steadier to the westward than to the eastward of them.

(2) ARQUIPÉLAGO DE CABO VERDE TO PORTS ON THE NORTH COAST OF BRAZIL.—No particular crossings of the Equator are necessary (*see* (3) below), as the eastern coast has not to be weathered. From abreast the Arquipélago de Cabo Verde steer a direct course, taking care to make the coast to the eastward of the destination, and thence steering along the coast in 10 to 15 fathoms ($18^{m}3$ to $27^{m}4$).

(3) ARQUIPÉLAGO DE CABO VERDE TO THE EQUATOR.—In considering where to cross the equator it is necessary to bear in mind that if a vessel crosses far to the westward there will be a less interval of doldrum to cross, but it may be requisite to tack to weather the coast of South America, and these crossings vary during the year, as the direction of the South-East Trade wind is more southerly when the sun is north of the equator than when south.

After passing the Arquipélago de C. Verde, stand to the southward between the meridians of 26° and 29° W., being nearer 26° W. from May to October, and nearer 29° W. from November to April. The equator should be crossed at points varying according to the season of the year, as follows:—

Between January and April, when the North-East Trade winds are well to the southward, continue on a southerly course, and cross 5° N. lat. between 25° and 28° W., and the equator between 28° and 31° W.

In May and June the southerly winds will be met with between 5° and 10° N. lat. On meeting them, stand on the starboard tack so as to cross lat. 5° N. between long. 18° and 20° W. Between 5° and 4° N., go round on to the other tack, and cross the equator between 25° and 23° W.

In July, August and September, the southerly winds will be met with between 10° and 12° N. On meeting them steer on the starboard tack so as to cross lat. 5° N. between 17° and 19° W. Go round then on the other tack, and cross the equator, as in May and June, between 25° and 23° W.

In October, November and December, the southerly winds will be met with between lat. 8° and 6° N. On meeting them, steer so as to cross lat. 5° N. between 20° and 23° W., then take the tack which gives most southing, and cross the equator between 29° and 24° W.

CAUTION. The South Equatorial current is not so strong in the northern winter as in the summer and autumn months; but the mariner must remember that the strength of the current increases as it advances towards the American coast.

(4) FROM THE EQUATOR SOUTHWARD.—*General directions.*—Having crossed the equator as recommended, stand across the South-East Trade wind on the port tack, even should the vessel fall off to W. by S., for the wind will draw more to the eastward as the vessel advances, and finally to East at the southern limit of the trade. When in the vicinity of St. Paul rocks, frequent astronomical observations should be made, the current watched and allowed for, and a good lookout kept, as these rocks are steep-to, and can only be seen on a clear day from a distance of about 8 miles. The same precautions are necessary, if passing westward of Arquipélago de Fernando de Noronha, when approaching the dangerous Atol das Rocas. A light is exhibited on Ilha do Farol (Pharol).

On approaching the Brazilian coast between March and September, when the wind is from the south-eastward and the current near the coast sets to the northward, it will be better to keep from 120 to 150 miles off the land until well to the southward, and steer so as to be to windward of the port of destination; but from October to January, when the north-easterly winds prevail and the current sets to the south-west, the coast may be approached with prudence, and a vessel may steer according to circumstances for her intended port.

CAUTION.—To supplement the directions contained in the following paragraphs, special attention should be paid to the description of the winds, weather, and currents to be found in South America Pilot, Part I, as far south as Cabo Virgenes (Cape Virgins); and thence southward round Cabo de Hornos (Cape Horn), in South America Pilot, Part II.

(5) TO RIO DE JANEIRO.—Make Cabo Frio during the North-East Monsoon (October to March) and give the coast a prudent berth, as a constant and sometimes heavy swell sets in. The islands at the entrance of the harbour should not be approached until the sea breeze is well set in, as a vessel may run into a calm and be exposed to the swell and current. *See also* Note under Route 1,053.

(6) To Montevideo or Rio de la Plata.—Stand direct through the South-East Trades, passing about 200 miles eastward of Rio de Janeiro.

The distance from the Channel to Montevideo is 6,110 miles.

(7) To Bahia Blanca or ports to the southward.—Bound to Bahia Blanca, or if, having called at Montevideo, and bound to the southward, after leaving, or passing Rio de La Plata, keep well in with the coast. This can be done with safety, as the winds are almost always from the westward, and an easterly gale never comes on without ample warning. Pass Cabo Corrientes at a distance of 40 to 50 miles, and make the land to the southward of Cabo Blanco and afterwards keep it topping on the horizon until the entrance of Estrecho de Magallanes (Magellan strait) be passed.

Notes.—This western route cannot be too much insisted on, and a vessel would do well to make a tack in-shore, even though with apparent loss of ground, to maintain it. As long as the wind does not back to the eastward of South the water will be smooth, and more sail can be carried than if farther out; and should the wind come from south-east (unless when just off Cabo Blanco), the land recedes so much as to afford plenty of sea-room.

Only steam vessels should use the Estrecho de Magallanes (Magellan strait). The passages of the old navigators, some of whom were more than 80 days between Puerto del Hambre (Port Famine) and Cabo Pilar (Cape Pillar), sufficiently attest the inadvisability of the attempt for sailing ships.

(8) To the Pacific ocean round Cabo de Hornos (Cape Horn).

(a) If calling at an intermediate port.—Proceed as detailed in (7) above.

(b) Direct route.—Bound around Cabo de Hornos (Cape Horn), without calling at any intermediate port, the usual track is to take as direct a course as possible from the position 200 miles eastward of Rio de Janeiro (*see* (6) above) to about lat. 45° S., long. 60° W., and from thence so as to pass 30 to 40 miles eastward of Isla de los Estados (Staten island). *(See* caution at the end of (4) above). This track lies between 120 and 200 miles eastward of the Patagonian coast, and is the most direct route for a large and well-found ship. The older navigators, however, recommend that sailing ships should keep within 100 miles of this coast, in order to avoid the heavy sea that is raised by the westerly gales and to profit by the variableness of the inshore winds when from the westward.

Near the coast from April to September, when the sun has north declination, the winds prevail more from W.N.W. to N.N.W. than from any other quarter. Easterly gales are of very rare occurence, and even when they do blow, the direction being obliquely upon the coast, it is not hazardous to keep the land aboard.

From October to March, when the sun has south declination, though the winds shift to the southward of west, and frequently blow hard, yet as it is a weather shore, the sea goes down immediately after the gale. The winds at this time are certainly against making quick progress, yet as they seldom remain fixed in one point, and frequently shift backward and forward 6 or 8 points in as many hours, advantage may be taken of the changes so as to keep close in with the coast.

(9) Navigational Notes. (*a*) *Passing Isla de los Estados (Staten island) and Estrecho de le Maire (Le Maire strait).*—The usual course, suitable for all times, is to pass eastward of the island; there are, however, several advantages in passing to the westward of the island, through Estrecho de le Maire, which may be enumerated as follows:—

(i) It is the shortest route round Cabo de Hornos, and a vessel on emerging from the strait will stand easily 60 miles further on her course than when in the same latitude outside Cabo San Juan (Cape St. John), Isla de los Estados; a very sensible gain when the difficulties attending the making of westing in these latitudes is taken into account.

(ii) A further advantage is that between the strait and Cabo de Hornos there is less exposure during westerly gales to the heavy seas, and the vessel will also avoid the north-easterly current, which is ordinarily met on the way from Cabo San Juan.

On the other hand, the conditions must be suitable. A vessel should not attempt the strait except during daylight (for it is unlighted), and with a fair wind and tide; the best time for beginning the passage through being at one hour after high water. A vessel should, if necessary, heave-to off the entrance of the strait until that moment. Under these conditions, even should the wind fail, or come adverse, a vessel would probably drive through rapidly, for the tidal streams are strong. With a fair wind, force 6, the passage of the strait has been made in two hours. With a southerly wind, however, it would not be advisable to attempt the strait, for, with a weather tide, the sea is very turbulent, and might severely injure and endanger the safety of a small vessel, and do much damage to a large one. In calm weather it would be still more imprudent, unless the western side of the strait can be reached, where a vessel might anchor, on account of the tidal streams which set over to the Isla de los Estados side, where, if it became requisite to anchor, it would necessarily be in very deep water, and close to the land.

Should the northerly wind fail, and the tidal stream not be sufficiently strong to carry a vessel through, there is a convenient anchorage in Good Success Bay (*see* S. America Pilot, Part II).

Northerly and north-easterly winds are often accompanied by thick, misty weather; vessels approaching the strait are thus often compelled to lie-to for a time.

caution. If the route eastward of Isla de los Estados (Staten island) be taken, there is, off Cabo San Juan, the eastern point of the island, a heavy tide-rip which extends for a distance of 5 or 6 miles, or even more, to seaward. When the wind is strong and opposed to the tidal stream, the overfalls are overwhelming, and very dangerous, even to a large and well-found vessel. Seamen must use every precaution to avoid this perilous area.

(b) Rounding Cabo de Hornos (Cape Horn)

June and July are the best months for making a passage to the westward around Cabo de Hornos, as the wind is then often in the eastern quarter. The days are short, however, and the weather cold.

August and September are bad months, heavy gales with snow and ice occurring at about the time of the Equinox.

From October to March, the summer months, the winds are almost invariably westerly.

In April and May, the winds are slightly more favourable.

The passage from East to West around Cabo de Hornos should usually be made in about lat. 57° S., or at about 100 miles southward of the cape, but if, after passing Isla de los Estados, the wind be westerly, the vessel should be kept upon the starboard tack, unless it veers to the southward of S.S.W., until in latitude 60° S., and then on the tack upon which most westing may be made. On this parallel the wind is thought by some persons to prevail more from the eastward than any other quarter.

It would usually be necessary to stand southward in this manner from August to March; but from April fair passages have been made by keeping nearer the land and sighting Islas Diego Ramirez. There is no advantage to be gained by attempting, even with a fair wind, to go close to Cabo de Hornos; for the eastward-going Southern Ocean current sets close past the cape, and appears to flow with greater velocity under the land than farther seaward on the route from Cabo San Juan.

For routes onward into the Pacific ocean see Part III, Chapter III, page 319.

Route 1,008. Channel to western French ports, Lisbon and Gibraltar

For all destinations, on leaving the English channel at once make westing, as the prevailing winds are from that direction. With a fair wind, from the Lizard, steer to the west-south-westward to gain an offing in long. 10° or 12° W.

(1) To Western French ports.—The above west-south-westerly course should be modified, according to weather, in order to reach more directly the destination; but it must be borne in mind that the prevailing winds and currents have a tendency to set a vessel towards Ushant and the many surrounding dangers. If circumstances require it, shelter may be obtained in one of the French anchorages until the weather improves, but Pointe de Penmárc'h should never be made.

(2) To Lisbon.—Having gained an offing in long. 10° or 12° W., and with the wind from the westward, haul to the wind on the tack which will best enable the approach to the proper course to be made without being drawn into the Bay of Biscay, which is especially to be avoided. During and after south-westerly gales the indraft of the Bay is strongest, and is most to be guarded against.

Should southerly and south-easterly gales have been experienced the vessel will have been driven westward, and in this case the aim should be to make progress southward. On the other hand, if westerly gales have prevailed, and the vessel has become embayed, it may be found difficult to weather Cabo Finisterre or even Cabo Ortegal; under these circumstances refuge may be found in El Ferrol, La Coruña, Ria del Barquero, or Ria de Vivero; and, in extreme cases, in the ports and roadsteads of France from the Gironde to Brest.

Rather than run any risk of becoming embayed in this manner, it will be better to make a long board to the westward (as described above), and since westerly winds generally alter to north-west, if a good offing has been made, the course can afterwards be pursued a point or two free, making allowance for a south-easterly set.

Proceeding southward from off Cabo Finisterre, shape course to clear Os Farilhões and Ilha Berlenga (Burling islands), which should be given a wide berth in thick weather; with south-westerly winds it is better to keep off the land, to avoid the northerly current that sets along the coast with those winds, as well as to be in a position to profit by any change of wind to the westward and north-westward. In short, it is better to run to the southward at some distance from the coast of Portugal, as westerly winds make it a lee shore, and in winter these gales are frequent, blowing with great strength, and continuing for several days together.

Bound to Lisbon, when abreast Ilha Berlenga, steer for a position off Cabo da Roca.

(3) To Gibraltar.—Take route (2) above to clear Os Farilhões and Ilha Berlenga, and then continue down the coast as far as Cape St. Vincent (Cabo de São Vicente); thence shape a course for the Strait of Gibraltar, as follows:—

Cape St. Vincent should be sighted, and then, after rounding it, as the vessel proceeds south-eastward, the state of the wind and weather, and the indraft and current of the Strait of Gibraltar, must be considered and allowed for. With the wind from N.W., through North, to N.E., make Cabo Trafalgar; with it from West, through South, to East, make Cape Spartel (Cabo Espartel).

In thick weather the safety of the vessel may be assured by making the bank which extends about 20 miles from the coast abreast Cabo Trafalgar, but care must be taken, on nearing Isla de Tarifa (Tarifa point), to avoid Los Cabezos.

Cape Spartel, is safe to approach and can be seen from a long distance. Southward of Cape Spartel, the land falls, and has been mistaken for the mouth of the strait; so that at night, when the light is not seen, caution is necessary. If an easterly wind be met, and it is too strong to beat against, shelter will be found under Cape Spartel, the vessel either keeping under weigh, or anchoring off Playa de Jeremias, about 3 miles southward of the cape.

Navigational Note.—Strait of Gibraltar.—Working through.—With an easterly wind work in mid-channel to have the advantage of the current whilst the west-going tidal stream is running, but with the east-going stream either shore may be approached, with a chance of meeting favourable slants of wind; if it is blowing fresh, a vessel will (especially if she be able to gain the meridian of Cabo de Plata or Malabata point) get through the strait, provided she keep in mid-channel and can carry at least her topsails (even close reefed). When Tarifa is passed, the force of the wind lessens. If the easterly wind is so strong as to prevent a vessel carrying sail, take shelter under Cape Spartel, keeping under easy sail to await a favourable change.

When the easterly wind inclines to the northward, it is advisable to keep on the Spanish coast, avoiding Pearl rock (La Perla) but when it inclines to the southward, the African coast is preferable.

Route 1,009. Channel to Cape Town and the Cape of Good Hope

(1) Channel to the Equator.—Follow Route 1,007 (1) and (3).

(2) Equator to Cape Town and the Cape of Good Hope.—Having crossed the equator as recommended, stand across the South-East Trade wind on the port tack, even should the vessel fall off to W. by S., for the wind will draw more to the eastward as the vessel advances, and finally to East at the southern limit of the trade. When in the vicinity of St. Paul rocks, frequent astronomical observations should be made, the current watched and allowed for, and a good lookout kept, as these rocks are steep-to, and can only be seen on a clear day from a distance of 8 miles. The same precautions are necessary if passing westward of Arquipélago de Fernando de Noronha, when approaching the dangerous Atol das Rocas, on which a light was established in 1882. It was customary, in proceeding to the southward in the South-East Trade, to sight Ilha da Trindade (*Lat. 20° 30′ S., Long. 29° 19′ W.*) to test the rate of their chronometers, and to take a fresh departure; but this has become increasingly unnecessary owing to the availability of Radio Time Signals. During the greater part of the year the South-East Trade fails on a line drawn from the Cape of Good Hope to Ilhas da Trindade and Martin Vaz. This limit varies from 3°, according to the position of the sun.

When to the southward of the South-East Trade, fresh winds variable in direction will be met. Those from north-east through north to north-west, if accompanied by cloudy weather, often shift suddenly to south-west or south, but sometimes the wind steadies between west and west-south-west. From Ilha da Trindade shape course to the south-eastward to cross the parallel of 30° S., in about long. 22° W., and the meridian of Greenwich in about lat. 35° to 37° S., whence to the Cape of Good Hope winds from the westward and southward usually prevail. If bound eastward round the Cape of Good Hope, cross the meridian of Greenwich in about lat. 40° S. *See* Route 1,087.

After passing the meridian of Greenwich, a strong northerly current will be frequently experienced; and on nearing the land, when bound to Table bay, great attention is required, as there it will be found almost constantly running strongly to the northward, and, if disregarded, a vessel may have difficulty and lose time in reaching the bay. If bound to Simons bay during the southern summer months, it will be better to make the land about Cape Hangklip, as a strong current sets at that period across the entrance of False bay towards Cape point.

Approaching the Cape of Good Hope from the westward, if the weather be clear, Cape point light should be sighted at the distance of about 23 miles, but caution is necessary in hazy weather.

If near the coast at night, and the land is not visible, keep to the south-westward until the position is ascertained.

Note.—As the wind seldom, if ever, blows from the east or north-east (*i.e.*, directly off the peninsula), sailing vessels bound either for Table bay or round the Cape of Good Hope, should ensure a weatherly position to the north or south, according to the season of the year. Those for Simons bay have been detained many days by south-easters off the Lion's head and Hout bay, in consequence of their making the land too far to the northward during the summer season. The same winds would have been fair for them had they been 30 miles farther south. On the other hand, a vessel bound for Table bay in the winter season will find it difficult to make her port from a position off Cape point, during the continuance of north and north-west winds, notwithstanding the general prevalence of north-north-westerly current.

CAUTION. Under any circumstances, at night, there is great difficulty in judging the distance of lights situated under high land. Therefore, the prudent course for a stranger to pursue when making Table bay is to keep off and on until daylight, sufficient to the westward of Green point to prevent being becalmed near the land and set in upon the coast by the heave of the sea.

If proceeding round the Cape of Good Hope, without calling at Cape Town, to the Indian ocean, or to Australia see Route 1087.

Route 1,010. Channel to Sierra Leone or Nigerian ports

(1) To BATHURST, or SIERRA LEONE.—Follow Route 1,007 (1) as far as Madeira. Thence steer so as to pass 60 to 100 miles westward of Islas Canarias (Canary islands) and from abreast these islands take one of the following routes, according to season.

(a) November to April.—Steer due south to about lat. 20° N., and then edge over to the African coast, and steer as directly as possible to destination.

(b) May to October.—Keep more to the westward, so as to sight the easternmost island of the Arquipélago de Cabo Verde; and, after picking up the South-East Trade in about lat. 10° N., stand on the starboard tack direct to destination.

Note.—Some navigators recommend standing to the westward of the Arquipélago de Cabo Verde, from abreast Islas Canarias; the North-East Trade being sometimes held longer by doing so, and turning eastward after passing them.

(2) To LAGOS or CAMEROONS.—Follow (1) above to Islas Canarias; thence:—

(a) November to April.—Follow (1) (a) except that, after edging over towards the African coast, keep it at about 60 miles distance until abreast of port of destination.

(b) May to October.—Keep at about 200 miles off the African coast on the southward run, during the South-West Monsoon. Turn eastward in about lat. 6° N., or 7° N. and long. 15° W. and, closing the land to keep in the Guinea current, steer to destination.

Route 1,011. Channel to St. Helena

(a) Usual route.—Pursue the route to the Cape of Good Hope (Route 1,009) to beyond the South-East Trade, and then make sufficient easting to be able to enter the trade again and weather St. Helena, which should be approached from the south-east. As a rule, avoid going on the starboard tack, or decreasing latitude, until St. Helena bears about N.E. by N.

(b) Northern route.—From January to April another route, known as the northern route, is, by some authorities, deemed preferable; that is, pass eastward and Arquipélago de Cabo Verde and along the African coast until past Cape Palmas, and thence, keeping in the Guinea current, pass close to Ilha de São Thomé, and, if in the month of March, endeavour to reach about lat. 7° or 8° S., and long. 4° or 5° E., from whence St. Helena will generally be fetched on the port tack; but if in the month of June and early part of July it will probably be sufficient to get as far as 4° or 5° S. in the same longitude, as the wind then generally hangs more to the eastward.

Route 1,012.—*Reserved as spare.*

Route 1,013.—*Reserved as spare.*

Route 1,014. Ports in Bay of Biscay and on west coast of Spain and Portugal to ports in the Atlantic ocean or to the Channel

Whether bound to the northward or to the southward, the importance of making to the westward as quickly as possible, to join the routes to or from the Channel, cannot be too strongly stressed. From the Bay of Biscay, it may even be advisable to postpone sailing until a favourable wind enables a vessel to avoid all risk of being embayed. The indraft of the Bay is strongest after south-westerly gales.

See Routes 1,004 to 1,011 from the Channel and Routes 1,013 and 1,014 from Gibraltar.

Route 1,015. Gibraltar to the Channel

The passage through the Strait of Gibraltar from east to west against the general easterly current from the Atlantic is, even with a fair wind (especially during neap tides), somewhat difficult for sailing vessels, but with westerly winds, which increase the strength of the current, it is, for a large ship, almost impossible.

From Europa point (*Lat. 36° 06′ N., Long. 5° 21′ W.*) work along the coast of Spain during the west-going tidal stream until reaching Isla de Tarifa, and, if necessary, anchor there to await the next favourable stream. If from Algeciras, get under weigh at half ebb and so reach Punta del Acebuche by the commencement of the west-going stream.

If successful in doubling Isla de Tarifa by keeping the Spanish coast, continue working up Playa de los Lances while the tidal stream remains favourable, when, after gaining Punta de la Pena tower (if it be preferred not to work in-shore of Los Cabezos) cross to the African coast and work up under that as below directed. If the wind be south-westward with moderate weather keep to the Spanish coast, as by crossing to the African coast, where the wind will probably be less, a vessel will be set to leeward. Should the wind shift to W.N.W. or N.W. the Spanish coast should still be kept. (To avoid Los Cabezos, *see* West Coast of Spain and Portugal Pilot).

See Section D. Part I. Index on pages 340 and 341.

If unable to fetch Tangier by following these directions cross to the African coast and work up on the African coast with the favouring stream, anchoring when necessary until Tangier bay is reached. But Isla de Tarifa should be fetched before standing across, otherwise there will be no certainty of weathering Punta Cires, and should a vessel fall to leeward of it, it will be difficult even to regain Gibraltar bay. Having weathered Punta Cires (*Lat.* 35° 54′ *N., Long.* 5° 29′ *W.*), work within the counter current and near the shore to take advantage of any slant of wind that may occur, and then doubling Malabata point, gain Tangier bay, whence it will be easy to regain the Spanish coast. When the meridian of Tangier is passed, there is less current and a more manageable wind than in the narrows.

Note.—With westerly winds if a small vessel make Peninsula de la Almina, Ceuta, instead of Europa point, she may work up on the African coast within the limits of the tidal streams, anchoring during the east-going stream.

From southward of Ceuta to Gibraltar work up as far as Punta Cires, then taking advantage of the west-going stream, cross the strait, sailing a point free. If the wind is S.W. this is more easily done, with the favourable slants of winds met with on the African coast. When through the narrows there is less current and a more manageable wind.

In light winds, preserve a good offing when in the vicinity of Cape St. Vincent (Cabo de São Vicente), as the currents generally set strong along the land, and have a tendency towards the cape. Ripples are occasionally seen about 3 miles south-westward of and off the cape. After passing Cape St. Vincent stand out to the north-westward with the prevailing northerly winds until a favourable wind is met. Get an offing of at least 100 or 150 miles to avoid the south and south-easterly current near the coast of Portugal.

If a southerly wind should be met with, stand to the northward, keeping sufficiently to the westward to be able easily to weather Ushant, and do not steer an easterly course until north of the parallel of that island.

Route 1,016. Gibraltar to Halifax or New York

Having cleared the strait as described in Route 1,015 above, stand to the south-westward into the North-East Trade wind. Thence continue as described in Route 1,004 (b).

Route 1,017. Gibraltar to West Indies, South America, Cabo de Hornos (Cape Horn) or Cape of Good Hope

Having clearer the strait as described in Route 1,015, stand to the south-westward to join Routes 1,005 to 1,009 from the Channel.

Route 1,018.—*Reserved as spare.*

(ii) ROUTES IN THE MEDITERRANEAN

Route 1,019. Gibraltar to Gulf of Lions and Genova (Genoa)

After leaving Gibraltar, while still in the strait, keep in the middle of the channel whether the wind be from the eastward or westward; thence follow the summer, or the winter route described below.

(a) Summer route.—Pass through the Majorca channel, and if bound to Marseille sight Cabo de San Sebastian or Cabo Creus before crossing the Gulf of Lions; but if bound to the Gulf of Genoa (Golfo di Genova) make the land about the Îles d'Hyères. In most cases, bound to Genova (Genoa), or Livorno (Leghorn), the sooner the coast of Provence is made, the more secure the voyage, unless the wind should be settled from S.E. to S.W.

(b) Winter route.—Keep along the coast of Spain up to Cabo Creus, where shelter may be obtained in Bahia de Rosas in case of a northerly gale or bad weather, and thence, if bound to Marseille, stand across the Gulf of Lions and pass well to the westward of Île de Planier, but in case of a south-east wind endeavour to make easting as quickly as possible as far as long. 5° E. If bound to the Gulf of Genoa, make the Îles d'Hyères.

CAUTIONS. Sailing vessels rounding Cap Corse, the north end of Corsica, in the winter, should give it a berth of 6 or 8 miles, as within that distance dangerous whirlwinds and squalls come off from the cape.

In approaching the northern shore of the Gulf of Lions, with southerly winds, the greatest caution is necessary, as the currents with these winds set strongly to the northward and north-westward, and many vessels have been wrecked.

Route 1,020. Gibraltar to Sardinia, Sicily or Napoli (Naples)

There is a summer route, and a winter route, as follows:—

(a) Summer route.—With a fair wind, pass between Isla de Alborán and the coast of Spain (about 30 miles distant), and midway between Islas Baleares (Balearic islands) and the coast of Africa, along the south coast of Sardinia, and north or south of Sicily according to the port to which bound.

With an easterly wind, work to windward in mid-channel, and then between the Islas Baleares (Balearic islands) and the coast of Africa, keeping nearer the coast of Africa with the wind to the southward of east, but nearer the islands with the wind to the northward of east.

(b) Winter route.—Keep along the coast of Spain as far as Cabo de Palos, and thence make for the south end of Sardinia, and pass north or south of Sicily.

Route 1,021.—Gibraltar to Malta

(a) Summer route (May to September).—Keep in the middle of the channel until abreast of Cabo de Gata, and thence along the African coast as far as Cap Bon to profit by the easterly current, passing north of La Galite. Thence proceed direct for Malta, passing north or south of Isola di Pantelleria and the Maltese islands according to circumstances.

(b) Winter route (October to April).—Westerly winds (S.W. to N.W.) principally prevail, making it desirable to keep along the coast of Spain as far as Cabo de Palos, and then steer for the south coast of Sardinia. Under all circumstances the African coast should be avoided in the winter, as the northerly gales make it a dangerous lee shore. From south of Sardinia make for Cap Bon, and pass north of Isola di Pantelleria and Gozo. With a strong south-westerly wind, however, the African coast may be kept as far as Cap Bon.

Note.—If leaving Gibraltar with an easterly wind, work to windward in mid-channel as far as Cabo de Palos, and thence to the south end of Sardinia. Thence make for Cap Bon, and pass north or south of Isola di Pantelleria and the Maltese islands according to circumstances.

Route 1,022.—*Reserved as spare.*

Route 1,023.—*Reserved as spare.*

Route 1,024. Malta to Gibraltar

(a) Usual route.—With a fair wind, after passing Cani rocks, keep well off the African coast to avoid the easterly current, and make the Spanish coast about Cabo de Palos, afterwards keeping along it to Gibraltar.

Great care is requisite in making the Strait of Gibraltar in the thick weather which usually accompanies easterly winds, as vessels mistaking the Rock of Gibraltar for Sierra Bullones (Apes' hill) and supposing they were passing through the strait and vice versa, have been wrecked in Mala and Tetuan bays, where the land is low.

With north-westerly winds work along the coast of Sicily to Isola Marettimo, taking care to avoid the Graham shoal with 15 feet ($4^{m}6$) water over it, which lies about 23 miles from the shore abreast Capo San Marco; and then work across to the south coast of Sardinia and the south coast of Spain. The difficulty of getting to windward with a westerly wind increases as the Strait of Gibraltar is approached, vessels being frequently obliged to remain some days at anchor on the coast. Short tacks should be made along the Spanish coast to avoid the easterly current in mid-channel.

CAUTION. If a north-westerly gale be encountered between Malta and Isola di Pantelleria, it is better to put back to Malta rather than risk straining the ship in the heavy sea then met in that channel.

(b) Alternative route.—Another route, and recommended as a better one, is, on leaving Malta, to stand on the starboard tack towards the coast of Africa, and work along it up to Cap Bon, and thence, as before, keeping well off the coast of Africa.

Route 1,025.—**Napoli (Naples), Sicily or Sardinia to Gibraltar**

At all times of the year pass along the south coasts of Sardinia and the Islas Baleares (Balearic islands), and keep along the coast of Spain from Cabo de Palos, noting the remarks in Route 1,024 (a) Page 229 and 230.

Route 1,026. Genova (Genoa) and Gulf of Lions to Gibraltar

At all times of the year make for Cabo de San Antonio, and then keep along the coast of Spain, noting the remarks in Route 1,024 (a) Page 229 and 230.

Route 1,027.—*Reserved as spare.*

(iii) ROUTES FROM PORTS ON THE WEST COAST OF AFRICA

Route 1,028. Sierra Leone or Arquipélago de Cabo Verde to Channel

Stand to the north-westward into the north-east trade wind. Run through the trade, passing west of the Arquipélago de Cabo Verde, and then follow the route recommended for sailing vessels from the Cape Town to England (*see* Route 1,044 and Chart 5,308 (in pocket at the end of the book)).

Route 1,029. Sierra Leone to Ascension island

When clear of St. Ann shoals run along the coast, within 50 miles of the land, until past Cape Palmas when an endeavour should be made to cross the Equator between the meridians of 3° 00′ W. and 8° 00′ W., and then, without making a tack, Ascension island will be fetched. During the month of November long-continued calms and a strong north-westerly current are experienced in the vicinity of St. Ann shoals.

Route 1,030. Gold Coast, Nigeria or Bight of Biafra to Sierra Leone or intermediate ports

(1) To SIERRA LEONE.—From the northern part of the Bight of Biafra (where the principal Oil rivers are) stand south, and, if possible, pass to the westward of Fernando Póo and cross the equator as soon as possible, unless the vessel can lie up as high as west-north-west. When southward of the equator stand to the westward in the equatorial current, and as westing is made the wind will be found to shift gradually round to the south-east. When in about long. 10° W. recross the equator and shape course for Sierra Leone.

From any place in the Gulf of Guinea, eastward of Cape Palmas, stand to the southward into the equatorial current, and then proceed as above.

(2) To INTERMEDIATE PORTS.—In working to windward in the Bight of Benin, it is advisable to stand off on the starboard tack during the day, and inshore on the port tack by night, tacking should the wind veer towards the west. If going some distance along the Guinea coast it is advisable to stand across the equator and make westing in the equatorial current.

In the harmattan season (December to February) the Guinea current near the land in this bight is checked, and inshore a westerly set is felt.

Route 1,031. Gold Coast, Nigeria or Bight of Biafra to Channel.

Stand to the southward of the equator into the Equatorial current, and then make westing, as from the Bight of Biafra to Sierra Leone. Re-cross the equator in about long. 20° W., and then, as from the Cape of Good Hope *(see Route* 1,044), run through the North-East Trade, and shape a course for the English channel.

Route 1,032. Gold Coast, Nigeria or Bight of Biafra to South America

(a) Via St. Helena.—Keep in the Guinea current until in the Bight of Biafra, and then work along the coast as far as the River Congo, from whence there will generally be little difficulty in reaching St. Helena by keeping on the port tack. From Cape Palmas a vessel on the starboard tack will generally reach Cap Lopez, and often south of Annobon.

From St. Helena, keep in the South-East Trade, at about lat. 20° S., until leaving Ilhas Trindade, when edge off for Rio de Janeiro, or directly thence to the required destination.

(b) Via Ascension.—Stand to the southward on the starboard tack, generally weathering Ilha de São Thomé, as far as the equator; then stand to the westward, taking care to keep in the Equatorial current. Nothing will at first be made, but the vessel will be pretty sure to come up as she proceeds to the westward.

From Cape Coast Castle stand across the equator on the starboard tack, and then as above.

For vessels from the coast south of the Equator the winds are always favourable, gradually backing from south-west to south-east as the island is approached.

From Ascension, stand through the South-East Trade wind, to pick up Route 1,007 from Channel to South America and by it direct to the required destination.

Route 1,033. Gold Coast, Nigeria or Bight of Biafra, along the west coast of Africa to Cape Town or round the Cape of Good Hope

(1) To CAPE TOWN.—Along the whole shore of the Bight of Biafra work to windward with the land and sea breezes, anchoring when necessary to prevent being set northward by the current, especially during April and May, the season of calms and tornadoes.

From Cap Lopez to the Congo maintain a good offing, only approaching the shore to take advantage of the land breezes, which begin to blow at, or a few hours before, sunrise. In February, and sometimes in October, the sea breeze is so well to the westward as to enable vessels to lie along the coast on either tack, but during May the wind blows steadily along the coast from south and south-by-east, night and day, with a northerly current of one knot.

To cross the Congo stream either keep 200 miles off the coast or keep in anchoring ground; the latter preferred. The usual course is to beat alongshore as far as Ponta N'gelo (*Lat. 5° 44′ S., Long. 12° 08′ E.*), keeping on the bank of soundings in order to anchor if the wind falls light, and stretching across when the sea breeze has well set in.

From the Congo to Luanda, anchor every night when the sea breeze falls light; weigh with the first of the land breeze and continue on the port tack until about 1 p.m.; then tack, and by the time the sea breeze fails good progress will have been made to the southward.

From Luanda to Little Fish bay, when in the neighbourhood of Ponta das Palmeirinhas, as the current sets to the northward with considerable force, a good stretch off the land for 50 or 60 miles will enable the vessel to weather the point; it seldom answers to work alongshore. Do not get away from the land more than 50 or 60 miles, as beyond these limits the sea breeze declines in force and draws more to the southward, which would necessarily cause a loss of ground on the inshore tack, besides which the advantage of the alternate land and sea breezes, which are almost invariably experienced closer inshore, would be lost.

To the southward of Cape Negro there is no difficulty in working to the southward if due advantage be taken of the variations of the wind, and the tacks arranged accordingly. As rollers are frequent, the shore must be given a good berth. To the southward of Cape Frio northerly winds may be expected from May to August.

(2) To Cape of Good Hope.—Stand off and run through the Trade, and approach the Cape as when bound from England. *See* Route 1,009.

Route 1,034. Ascension to Channel

Ascension island lies on the direct route from Cape Town to the Channel, Follow the relevant part of Route 1,044.

Route 1,035. Ascension to ports in South America

Take the relevant part of Route 1,032 (b).

Route 1,036. Ascension to St. Helena

Proceed southward on the port tack, and when beyond the limit of the Trade wind make easting and re-enter the Trade sufficiently far to windward to ensure weathering St. Helena island. Avoid going on the starboard tack, or decreasing their latitude, until St. Helena island bears about 010°.

Route 1,037. Ascension to Cape Town or Cape of Good Hope

Run to the southward on the port tack through, and then out of, the South-East Trade. Then stand south-eastward with the object of crossing the Greenwich meridian in between lat. 35° S. and 37° S. (*Lat. 30° S.* will be crossed probably not westward of about *Long. 14° W.*).

Continue between the parallels of 35° S. and 37° S., and make destination from the south-west.

If bound to the Indian ocean without calling at an intermediate port, proceed as in Route 1,087.

Route 1,038. Ascension to the coast of Africa

Notes.—Leaving Ascension island on the starboard tack, a vessel will fetch the coast of Africa, according to the season of the year, at some point between Cap Lopez and Luanda or even farther southward. In the month of May, however, the wind hangs to the east all the way over, and a vessel will not weather Annobon; on the other hand, a good vessel, carrying a press of sail, will generally fetch up windward of the Congo. Two precautions are, however, requisite, the first is not to get northward of the parallel of 3° 00′ N. or 4° 00′ N., and the second, not to bring the port of destination to bear more than about 160°; an occasional short tack, as the wind shifts a little, may therefore be necessary, but the whole passage may sometimes be made with a free wind.

Route 1,039. Ascension to Sierra Leone

Take passage as directly as navigation permits.

Route 1,040. St. Helena to ports on the east coast of South America

Take the relevant part of Route 1,032 (a). If bound to Montevideo pass about 100 miles southward of Ilha de Trindade; steer thence as directly as possible to destination.

Route 1,041. St. Helena to Ascension and the Channel

Both St. Helena and Ascension lie on, or very close to the route from Cape Town to the Channel. Follow the relevant part of Route 1,044.

Route 1,042. St. Helena to West Coast of Africa

Vessels will generally fetch as far to the southward as Benguela, except in May, when the South-East Trade has more easting in it and the lee current is strong. To all places northward of Benguela, therefore, the winds are favourable. They veer round from south-east to south and south-west as the coast is approached.

Route 1,043. St. Helena to Cape Town or Cape of Good Hope

Run to the southward on the port tack through and out of the trade, and then stand to the south-eastward, crossing the meridian of Greenwich between lat. 35° and 37° S. (probably not getting westward of long. 10° to 14° W.). Then keep between these parallels, as in the passage from England to Cape Town, and make Cape Town or the Cape of Good Hope from the south-west.

If bound to the Indian ocean without calling at an intermediate port, proceed as in Route 1,087.

Route 1,044. Cape Town or Cape of Good Hope to St. Helena, Ascension, the Channel or Bordeaux

For directions for rounding the Cape of Good Hope from east to west *see* Navigational Note (ii) under Route 1,174.

(1) To the Channel.—First obtain a good offing to the north-westward, as squalls from the north-west and west-north-west are not infrequent near the coast, and have been experienced in both seasons. Then shape course for St. Helena (*Lat. 15° 55′ S., Long. 5° 42′ W.*); in cloudy weather get on its parallel some distance to the eastward, to avoid missing it, if intending to call there.

From St. Helena steer a direct course for Ascension, passing it on either side, and crossing the equator between long. 25° and 30° W. (in July between long. 20° and 25° W., to ensure better winds). Then make a northerly course to reach the North-East Trade as soon as possible (in July and August crossing lat. 10° N. west of long. 30° W.) and run through it. The Trade Wind will probably be lost in about lat. 26° to 28° N., and from long. 38° to 40° W., when westerly winds may be expected, and on reaching these shape course for the English channel.

Notes.—It is seldom advisable to pass eastward of the Arquipélago dos Açôres (Azores), but should the wind draw to the N.W. when near them the most convenient channel through them may be taken. If easterly winds are experienced after passing the Arquipélago dos Açôres the vessel should still be kept on the starboard tack, as westerly winds will probably be sooner found.

From November to February, a vessel should pass about 50 miles westward of Ilha das Flores and Ilha do Corvo; but from June to August, at about 250 miles westward of these islands. At other times of the year, at intermediate positions.

(2) To Bordeaux.—Proceed as in (1) above but begin to make easting on reaching lat. 30° N., passing between Ilha Terceira and Ilha de São Miguel in the Arquipélago dos Açôres and rounding the north-west point of Spain at from 60 to 80 miles distance.

Route 1,045. Cape Town or Cape of Good Hope to West Indies, Gulf of Mexico, Spanish Main or New York

Follow the route to the Channel *(see* Route 1,044) as far as long. 5° E. and then steer with a fair trade wind, towards Isla de Fernando de Noronha. On reaching lat. 10° S., at about long. 30° W., stand more to the northward, so as to cross the equator between long. 31° and 34° W., and as soon as the North-East Trade has been picked up, steer through it, and thence as follows:—

(1) To New York.—Endeavour to reach lat. 30° N. in long. 70° W. and thence steer as directly as possible to New York.

(2) To Spanish Main, Trinidad and the Guianas. Proceed towards New York as in (1) above; and leave that route when clear of the Equatorial counter-current and proceed westwards to destination as described in Route 1,006 (3).

(3) To Leeward islands, Jamaica, Belize or ports in the Gulf of Mexico.—Proceed as in (2) above, making westward as described in Route 1,006 (2).

(4) To Cuba.—As above, but make westward as described in Route 1,006 (1).

Route 1,046. Cape Town to South American ports

Follow Route 1,045 as far as about long. 10° W. in lat. 20° S. and then run along this parallel, with a fair South-East Trade wind to long. 30° W., whence steer direct for Rio de Janeiro, or if for ports to the southward, pick up, at long. 35° W., the outward route from the Channel, Route 1,007 (6), (7), or (8), to the required destination.

Route 1,047. Cape Town, northward, to ports on west coast of Africa

First obtain a good offing to the north-westward, as squalls from the north-west or west-north-west are not infrequent near the coast, and have been experienced in both seasons. Steer northward in the South-East Trade wind, taking advantage of the Benguella current.

Bound to ports on the coast eastward of Cape Palmas, proceed as directly as navigation permits after first obtaining the good offing described above.

Route 1,048 to 1,050.—*Reserved as spare.*

Routes from Cape Town eastward into and through the Indian ocean are described in Part II of Section C.

See Section D. Part I. Index on pages 340 and 341.

SECTION C. PART I.

Chapter II

SAILING-SHIP ROUTES FROM PORTS ON THE WESTERN SIDE OF THE ATLANTIC OCEAN

(i) ROUTES FROM PORTS ON EAST COAST OF NORTH AMERICA

Route 1051. Canadian ports and eastern ports of the United States to the Channel

The prevailing winds are fair, and the current favourable (Gulf stream and North Atlantic current). Steer either by Great Circle or by Rhumb line, taking care to avoid ice, and to keep clear, so far as possible, of the North Atlantic Lane Routes (described in the General Remarks at the beginning of Chapter II of Section B, Part I, Steamship Routes for the Atlantic ocean).

The Routes that follow, named as from "New York," are suitable for all ports on east coast, from Halifax to the southward, adapted, as necessary, to latitude of departure.

Route 1052. New York to Cape Town or Cape of Good Hope

On leaving New York, make for the intersection of lat. 35° N. with long. 45° W. It is better to be about 60 miles to the northward of this position in midsummer, and the same amount to the southward at midwinter. From this point there are two chief routes according to time of year, so as to have the shortest possible time in the Doldrums.

(a) May to September.—Steer thence so as to cross lat. 25° N., in long. 30° W., and thence through the North-East Trade until meeting the South-East Trade between lat. 1° and 5° N. On doing so, put the ship on the starboard tack, crossing lat. 5° N. between long. 17° and 20° W.—the more eastern longitude in July and August—and then go round on the other tack, crossing the equator between 25° and 23° W. *See also* Route 1,007 (3) for notes on crossing the equator. Thence stand to the southward through the South-East Trade, and begin to make easting from lat. 25° S., long. 30° W., running due east along the parallel of 35° S. as soon as it is reached, direct to destination.

(b) October to April.—From the position in lat. 35° N., long. 45° W., take a direct track through the North-East Trades, so as to cross lat. 5° N. between 20° and 23° W. The southerly winds will be met with in about lat. 7° N.; and on doing so, put the ship on whichever tack gives the most southing, and cross the equator between 20° and 24° W. *See also* Route 1,007 (3) as in (a) above.

Stand through the South-East Trades on an easy bowline, and when these winds are lost, steer south-eastward so as to cross lat. 30° S. in about long. 30° W., and thence so as to cross the meridian of Greenwich in lat. 40° S. From this point, steer direct for Cape Town, taking care not to be set to the northward by the Southern Ocean and Benguela currents, making to the north-eastward somewhat across the track.

For general directions for rounding the Cape of Good Hope when bound to the Indian ocean or to Australia, *see* Route 1,087.

Route 1,053. New York to South American ports. *(See* note after Route 1,051).

Take Route 1,052 as far as lat. 5° S., and then Route 1,007 (4), (5), (6), (7) and (8), accordingly as bound to Recife and the north coast of Brazil, to Rio de Janeiro, to Rio de La Plata, to Bahia Blanca, or round the Horn. *See* Navigational Notes in Route 1,007 (9).

Note.—Crossing the equator between March and September, when the wind is from the south-eastward and the current near the coast sets to the northward, keep from 120 to 150 miles clear of the land until well to the southward, and also keep to windward of the port when running in for it; but from October to January, when north-easterly winds prevail and the current sets south-westward, the coast may be approached to a prudent distance with advantage, and the port steered for direct. Vessels on this coast between October and March (the period of the North-East Monsoon), if bound to Rio de Janeiro, must be on their guard against the constant and heavy swell which sets in, making it dangerous to approach the entrance or islands off the entrance until the sea breeze has set in.

Route 1,054. New York to Rio Amazonas *(See* note after Route 1,051).

On leaving New York, stand to the eastward, so as to cross long. 50° W. at about lat. 33° N. Turn southward then, and make as directly as possible to destination, but nothing to the westward of long. 43° W. until reaching lat. 5° N., on account of the west-going Equatorial current, which will be strong on the port beam.

In July and August it will be advisable to make for long. 37° W., lat. 20° N., and stand southward then until the South-East Trade wind is picked up, between 5° and 10° N., thus approaching the Rio Amazonas from well to the eastward.

Route 1,055. New York to Caribbean Sea, and Gulf of Mexico. *(See* note after Route 1,051).

(1) To Barbados or Trinidad.—After leaving New York, make good easting, passing either side of Bermuda, but steering so as to cross the meridian of 60° or even 56° W., according to the season of the year, before entering the tropic and steering to the southward, always allowing for the current to leeward.

(2) To Antigua or Leeward islands.—Proceed as in (1), but it will not be necessary to go so far to the eastward as long. 60° W.

(3) To Mona passage.—Proceed as for (1) above; long. 66° W. will be a sufficiently eastward position on entering the tropic.

(4) To Jamaica or Colon (Panama canal).—Proceed as in (1) above, and then by Turk's Island passage and the Windward passage, which is the shortest route; for these the farthest east that will be necessary to make, from New York, is 68° W. long.

(5) To Puerto La Guaira (*Lat. 10° 37′ N., Long. 66° 56′ W.*) or ports to the eastward on the Spanish Main.—Keep eastward as in (1) and then pass through Mona passage (*See* (3) above), or one of the channels further eastward; in the latter case long. 60° W. should be reached before entering the tropic. It should be noted that a vessel making the land on the Main to leeward of her port will have considerable difficulty and lose much time in working to windward to gain it.

(6) To THE GULF OF MEXICO.—After passing Jamaica by (4), above, round Cabo San Antonio (west extreme of Cuba) and steer then as directly as possible for destination.

Notes.—The currents in the neighbourhood of the mouth of the Mississippi are very uncertain, fog and haze are very prevalent, especially in summer and autumn, the mud banks are very low, and the wind generally from the eastward; soundings should be obtained well to windward. If approaching from the southward or south-westward, great attention should be paid to checking the latitude, for the bank is so steep that the first cast may be 35 fathoms (64m0) only 3 or 4 miles from the South pass.

If bound to any southern port of the Gulf, a vessel should strike the eastern edge of the Yucatan bank between the parallels of 22° and 22½° N., and a knowledge of the exact point made is of great importance to check the longtitude, especially during the rainy season, March to September, when observations can seldom be obtained. Sounding therefore must be used early and constantly. In this season it is best to take the inshore track across the bank as regular land and sea breezes then prevail; but if bound to Vera Cruz in the *Norther* season *(See* West Indies Pilot, Vol. I), September to March, it is best to pursue the outer track, *i.e.*, between the Arrecife Sisal and the outer cays, and out into the open between the West Triangle and Nuevo cays.

Route 1,056.—*Reserved as spare.*

Route 1,057.—*Reserved as spare.*

(ii) ROUTES FROM THE GULF OF MEXICO

Route 1,058. New Orleans to New York or the Channel

Pass through Florida strait, taking full advantage of the Gulf stream, proceeding in it up the coast of the United States, if bound to New York; but if for the Channel standing to the north-eastward, so as to cross the meridian of 60° W., at lat. 40° N., and thence continue as directly as possible, with a favourable current and with prevailing westerly winds, to destination.

Route 1,059. New Orleans to Colon (Panama canal) or Mosquito coast

(1) To COLON.—When trading between New Orleans and Colon steer to pass 5 to 10 miles off Cabo San Antonio, Cuba, to a position 25 miles east-north-eastward of Farrall rock, Banco Gorda, and from thence pass 5 to 10 miles westward of Old Providence island, and from there steer direct to Colon.

(2) To MOSQUITO COAST.—Bound for the Mosquito coast after passing Cabo San Antonio steer to pass westward of Swan island and Cayos Vivario, and thence through the Mosquito channel.

See Directions for the Mosquito channel in West Indies Pilot, Vol. I.

Ronte 1,060. South-west part of Gulf of Mexico to the Atlantic (New York or the Channel)

From the south-west ports in the Gulf of Mexico take the passage inshore along the coast of Yucatan, where the adverse current is weak. Bound eastward pass over the Yucatan bank within the shoals, but the passage between Arrecife Sisal and the coast should only be taken by daylight. In returning through Florida strait from any part of the Gulf, and in proceeding up the Atlantic coast of the United States, take all possible advantage of the Gulf stream. (*See* Route 1,058).

Ronte 1,061.—*Reserved as spare.*

(iii) ROUTES FROM CARIBBEAN SEA AND WEST INDIAN ISLANDS

Route 1,062. Belize to Channel or New York

(1) To THE CHANNEL.—Proceed direct to Havana, thence through Florida strait with the Gulf stream to about midway between Bermuda and Halifax; thence after crossing the meridian of 40° W. in about lat. 45° N., continue direct to England.

(2) To NEW YORK.—Take passage as described in Route 1,058.

Route 1,063. Belize to New Orleans

Steer to pass 35 miles eastward of Isla Mujeres, and thence continue as directly as possible to destination.

Route 1,064. Colon or Columbian ports to the Channel, New York or New Orleans

(1) To THE CHANNEL.—Steer to pass through the Windward passage, between Haiti and Cuba, and thence free on the starboard tack into the westerly winds. When in the westerlies, steer to cross the meridian of 40° W. in about lat. 44° N. in the summer months, and about lat. 40° N. in the winter months. Thence continue as directly as possible to the Channel.

Note.—A vessel will make most easting in starting, during the summer months when the Trade is eastward of south.

(2) To NEW YORK.—Pass through Windward passage as in (1) above and, having cleared Turk's island, stand to the north-westward in the Antilles current, until picking up the Gulf stream in lat. 27° N., northward of the Bahama islands, and thence proceed as directly as possible along the Atlantic coast of the United States. *Also see* East Coast of the United States Pilot, Vols. I and II.

(3) To NEW ORLEANS.—Take the reverse of Route 1,059 (1) as far as the position off Farrall rock, after which a course can be shaped to pass 30 to 40 miles westward of Cabo San Antonio, and then to the mouths of the Mississippi.

Route 1,065. From ports of the Spanish Main to the northward.

From any of the ports along the Venezuelan coast and along the Main in the Caribbean sea, work along shore to the eastward in the eddies or counter current, until able to fetch the desired port on the starboard tack. At times, however, off Venezuela, the westerly current is so far inshore, that vessels have to cross it and work up northward of it, as mentioned, for Curaçao (*see* Route 1,067). In the winter, when the wind is well to the north-eastward, it is necessary to make more easting than in summer, when the wind is in places eastward of south.

From any of the Venezuelan ports, the Mona passage between Puerto Rico and Haiti is the best route for sailing vessels bound to New York, to any United States Atlantic port, or to the Channel.

Route 1,066. Jamaica to New York, Halifax, or the Channel

Take one of the two following routes, according to season.

(a) April to September.—Run to leeward round the western end of Cuba, and then through Florida strait, thus getting full benefit of the Gulf stream. Thence proceed as described in Route 1,058.

(b) October to March.—At this season of the year, northerly winds prevail in the Florida strait, and the

See Section D. Part I. Index on pages 340 and 341.

Windward passage should be preferred, although ships are frequently opposed here by contrary winds and currents. These may to some extent be overcome by keeping nearer the coast of Santo Domingo, Haiti, as there a windward current is frequently found.

When through the Windward passage, use either the Crooked island, Mayaguana, or Caicos passages according as the wind may favour, and from thence proceed direct to New York or Halifax. If bound to the Channel, *see* Route 1,064, onward from Windward passage.

Route 1,067. Jamaica to Curaçao or ports of the Main

Work to windward along the south coast of Haiti, where at full and change of the moon, and also near the time of the autumnal equinox, there is often a counter or easterly set, until on, or to windward of, the meridian of Curaçao; then stand across for it when certain of fetching well to windward to allow for the prevailing westerly current. In the summer months it is necessary to make more easting than in the winter months, as the wind has more southing in it and the current is stronger than during the winter months.

Note.—Should a vessel, having reached the Main, find herself to leeward of her port, she will usually find a counter or easterly set near the shore in which she can work up; failing to do this, if eastward of the meridian of 70° W., she may possible have again to cross the prevailing westerly set, and work up northward of lat. 14° or 15° N.

Route 1,068. From any West Indian island to United States ports, to Canadian ports or to the Channel

The great object for sailing vessels is to get north into the westerly winds as speedily as possible, and Bermuda lies in the track (or near the best track) for this purpose, though a course east or west of it may be taken according to the direction of the wind met with and the season of the year. A more northerly route is followed in the summer season than in the winter.

From Barbados, fetch to windward of all the islands, but from the other Windward islands pass close to leeward of Antigua, taking care not to come within a depth of 10 or 12 fathoms ($18^{m}3$ to $21^{m}9$).

Having cleared the other islands, and when steering directly for Bermuda, vessels sometimes fall to the eastward of the course, and find it very difficult to make the latter island when westerly winds prevail; in this case take advantage of the Trade wind to reach the meridians of 68° or 70° W. before going north of the parallel of 25° N.

Bound to the Channel, or Western Europe, it is seldom advisable to pass to the eastward of the Arquipélago dos Açôres (Azores), but a passage between Ilha do Corvo and Ilha das Flores and the other islands of the Arquipélago is recommended by some navigators. If easterly winds are met with after passing the Arquipélago dôs Açôres, still keep on the starboard tack, as by so doing westerly winds will probably be sooner found.

Route 1,069. Barbados to Demerara or other ports to the eastward of it

Keep close on a wind until abreast the port before attempting to cross the prevailing westerly current, particularly during and near the months of August and September when the current is strong and the wind well to the southward of east. At this season a square-rigged vessel might find it necessary to beat to windward to get abreast her port before crossing the current. It has been recommended at this season that sailing vessels should not come southward of lat. 8° N. until they are certain of fetching their port.

(IV) ROUTES FROM RIO AMAZONAS AND SOUTH AMERICAN PORTS TO THE SOUTHWARD AND FROM CABO DE HORNOS (CAPE HORN) TO THE EASTWARD.

Route 1070. Rio Amazonas to Recife

(a) General route.—The general route is close inshore out of the influence of the westerly current, and by taking advantage of the current, tidal stream, and every slant of wind, a sailing vessel will generally perform the voyage from Rio Amazonas to Recife in about 30 days. During the prevalence of east-north-easterly and north-easterly winds a current sets to east-south-eastward along and near the coast; this fact is well known to the masters of the coasting craft and is taken advantage of by them.

When the weather will admit, a vessel may anchor off any part of the coast without danger. In working along shore, the dry season (July to December) is considered preferable, as the winds are then fresh and steady. Stand off during the day, and in towards the land at night, so as to be near the coast in the morning to take advantage of the land wind, by which a good sailing vessel will make from 40 to 50 miles a day.

In the rainy season (January to June), working to windward is more tedious, as calms, light variable winds, squalls and rain prevail. In this case stand on the tack that is most favourable, and, as a general rule, do not go outside 30 fathoms ($54^{m}9$) water. Should the wind be steady, tack as in the dry season, but do not lose sight of the coast.

(b) Alternative route.—Should, however, the mariner prefer standing direct to the northward from Rio Amazonas across the equator into about 10° N., and then tack, he will save wear of men, sails and rigging, and will probably reach Recife in about the same time.

Route 1,071. Rio Amazonas to New York or the Channel

After getting a good offing, stand northward as close to the wind as possible, so as to pick up the main Atlantic routes to the northward; that to New York (*see* Route 1,044) at about lat. 10° to 15° N., and that to the Channel (*see* Route 1,045) between lats. 25° and 30° N., passing well to westward of the Arquipélago dos Açôres (Azores) during the summer months, but further to the eastward or even between the islands of the group, during the winter months. *See also* Route 1,073.

Route 1,072.—*Reserved as spare.*

Route 1,073. Recife and Brazilian ports (to the northward) to the Channel or to New York

(1) To THE CHANNEL.—From Recife and the north coast of Brazil, after obtaining a good offing, stand to the northward at once, and after crossing the doldrums, stand through the North-East Trade into the Westerlies, and shape a course for the English Channel. It is seldom advisable to pass eastward of the Arquipélago dos Açôres (Azores), but should the wind draw to the north-westward when near them, the most convenient channel through them may be selected, If easterly winds are experienced after passing the Arquipélago dos Açôres, it will be more advantageous to keep on the starboard tack and make northing, as westerly winds will probably sooner be found.

(2) To NEW YORK and NORTH AMERICAN PORTS.—Proceed as in (1) above, and when the doldrums are

See Section D. Part I. Index on pages 340 and 341..

crossed, and the North-East Trade wind reached, stand direct for the required destination by the main sailing route from Cape of Good Hope from about lat. 10° N. *(See* Route 1,045 (1)).

Route 1,074. Pôrto do Salvador (Baia) to Europe or to North America

In leaving the ports immediately to the southward of Recife for Europe, the north-east winds sometimes compel sailing vessels to keep on the port tack for 10 or 15 days, and to stand south-eastward, or even south-south-eastward, to the parallels of 28° or 32° S.; and as far east as the meridian of Ilha da Trindade. Then on the starboard tack it should be possible to weather the easternmost part of the coast, and also Ilha de Fernando de Noronha. As northing is made the wind will veer from east to south-east, and the equator should be crossed in 27° to 29° W.

Route 1,075. Rio de Janeiro to Pôrto do Salvador (Baia) or Recife

General Notes.—In going to the northward along the east coast of Brazil, it is preferable first to make a stretch to the south-eastward. Working along the coast, bordered by reefs, subject to currents, and light winds at night, cannot be attended with much success.

The Brazil monsoons do not extend more than 120 or 150 miles out to sea. Beyond this limit the trade wind is found, which generally blows between south-east and east.

(a) November to February.—From Rio de Janeiro to the northward, during the months of November, December, January and February, fresh north-east winds and a southerly current of one or 1½ knots extend along the coast, especially in the vicinity of Cabo de São Tomé, the wind being also more northerly than in the offing; therefore it is necessary to stand for 450 to 600 miles to the east-south-eastward before tacking. The months of November, December and January, especially the latter two, are the most unfavourable months for going to the northward. During the other two or three months of the North-East Monsoon, do not stand further eastward than actually necessary for weathering the Abrolhos islets, as from their parallel northward the winds will be about east or east by south.

(b) March to September.—From March to September close the coast as near as possible, taking advantage of the change of wind near the land, and making short tacks to the eastward on meeting the fresh north-east winds off Cabo Frio and Cabo São Tomé, which sometimes blow during the South-East Monsoon. Then continue along the coast at distances of from 30 to 90 miles. A more easterly route is generally used, but if bound for Pôrto do Salvador it does not appear advantageous to stand too far off the land.

Route 1,076. Rio de Janeiro to Europe or North America

Make first a stretch to the south-eastward to about long. 35° W., and then stand northward, in the South-East Trade, crossing the equator between 27° and 32° W.; and after passing through the doldrums, steer direct for American ports, or to the north-westward, and westward of the Arquipélago dos Açôres (Azores), if bound to European ports.

Route 1,077. Rio de Janeiro to the Cape of Good Hope

Stand to the south-eastward and cross the meridian of 30° W. in about lat. 32° S.; 20° W. in lat. 35½° S., 10° W. in lat. 37° S.; the meridian of Greenwich in lat. 37½° S.; and 10° E. in lat. 37° S.; making the Cape of Good Hope from the south-westward.

If bound to the Indian ocean, without calling at Cape Town, cross the meridian of Greenwich in about lat. 40° S., and run eastward on that parallel. *See* Section C., Part II, Chapter I., and Route 1,087.

Route 1,078. Rio de La Plata to Europe or to North America

Take one of the two routes described below, according to season.

(a) May to September.—From May to September proceed direct to Cabo Frio, and thence across the equator in 27° to 29° W., as from Rio de Janeiro. *See* Route 1,076.

(b) October to April.—From October to April stand to the eastward to beyond long. 30° W., and thence to the northward into and through the Trade wind, as from Rio de Janeiro. *See* Route 1,076.

Route 1,079. Rio de La Plata to the Cape of Good Hope

On leaving the river, steer to pick up the parallel of 40° S. at long. 30° W. Thence, keep along that parallel as far as the meridian of Greenwich, whence steer directly for Cape Town, or, if bound to the Indian ocean without calling at that port, continue eastward along, or, in the summer, a few degrees southward of, the parallel of 40° S. *See* Route 1,087.

Route 1,080. Rio de La Plata to the Falkland islands

Keep well to the westward of the direct route until nearing the islands.

Route 1,081. Rio de La Plata to round Cabo de Hornos (Cape Horn)

(a) Main route.—From the mouth of the river steer south-eastward so as to pick up and follow Route 1,007 (8) (b).

(b) Alternative route.—A well recommended route is to follow that given in Route 1,007 (7).

Note.—See Navigational Notes (a) and (b) in Route 1,007 (9).

Route 1,082.—*Reserved as spare.*

Route 1,083. Cabo de Hornos (Cape Horn) to the Channel

(1) FROM THE PACIFIC TO THE ATLANTIC ROUND CABO DE HORNOS.—Rounding the Horn from West to East is a comparatively easy matter, for the prevailing winds are favourable and the current sets strongly to the eastward as Cabo de Hornos itself is approached. The passage is usually made between lats. 56° and 57° S. to the northward of the route from the Atlantic ocean to the Pacific ocean (*see* Route 1,007 (8)); the current does not run strongly at 50 miles southward from Cabo de Hornos. December and January are the most favourable months; June and July, when easterly winds are not unusual, are the least favourable. August and September are months in which heavy westerly gales may be expected, with snow and hail.

See also Route 1,401 and Note under the same; and also, regarding fog, under Route 1,375.

(2) FROM CABO DE HORNOS TO THE EQUATOR.

(a) Usual route.—The usual route is to pass about 80 miles southward of the Falkland islands, and to make for a central point in about lat. 35° S., long. 30° W., but to the westward of it between April and August, or to the eastward of it from September to March. From this point there are two routes northward, according to season, as follows:—

(i) April to August.—Stand northward to the intersection of lat. 10° S. with long. 25° W., keeping as much as possible to the westward of that meridian throughout, and cross the equator between 25° and 28° W. It might even be possible to pass between Cabo Frio and Ilha da Trindade at this time of year.

(ii) September to March.—From the position in lat. 35° S. stand on to the north-north-eastward to about long. 20° W. and lat. 25° S., and then run northward with the South-East Trade wind, and cross the equator between longs. 22° and 25° W.

(b) Alternative routes consequent on ice conditions.—There are three alternative routes (i), (ii), and (iii) below, if ice is seen to be prevalent; they are particularly suitable to the months between October and February.

Ice may be met with eastward of Cabo de Hornos and the Falkland islands at all times of the year, but is most common between October and February, which are the most favourable months for rounding Cabo de Hornos, as stated in (1) above.

The mean ice limit for this region trends northeastwards from Cabo de Hornos, through lat. 50° S., long. 52° W., as far as lat. 40° S., long. 35° W., but icebergs have been met with as far west as the Falklands; northward of 40° S. they are rare, but a good look-out should still be kept for them.

Numerous icebergs and extensive icefields have also been seen different times in the space south-eastward of the above limit. Some of these icebergs have exceeded 20 miles in length, and were very numerous in 1892, 1893, and 1894. In 1906 numerous icebergs were seen north-westward of the above limit; in long. about 56° 30′ W. they extended from lat. 50° to 45° 30′ S.

Icebergs should, if possible, be passed to windward to avoid the loose ice floating to leeward.

(i) After rounding Cabo de Hornos steer so as to cross the parallel of 50° S. in about long. 51° W., and the parallel of 40° S. in about long. 45° W., and then make northing until the South-East Trade is met; joining with Route 1,078 (b) from Rio de La Plata (October to April) at about lat. 35° S.

(ii) Some navigators recommend the following route.—From October to February, pass westward of the Falkland islands, on account of the greater freedom from ice then, in that region, and then stand to the north-eastward, joining with alternative route (i) at lat. 35° S. in about long. 41° W.

(iii) If unable to pass west of the Falkland islands, pass as close to the eastward as the wind will allow, and thence as above.

CAUTION.—If meeting with a foul wind, whilst to the southward of 40° S., it would be better to stand to the north-westward than to the eastward, as ice is likely to be encountered not far to the eastward of the Falkland islands.

(3) FROM THE EQUATOR TO THE CHANNEL.—Follow Route 1,044 (i) Cape Town to the Channel, which joins the route from Cabo de Hornos at the Equator. From April to August keep on the western side of the northward track, and from September to March on the eastern side.

Route 1,084. Cabo de Hornos (Cape Horn) to North American (East coast) ports

(a) April to August.—Take Route 1,083, as far as lat. 10° S., long. 25° W., at which point the track from the Cape of Good Hope to North American ports (Route 1,045 (1)) crosses that from Cabo de Hornos; follow it to destination.

(b) September to March.—Follow the route from Cabo de Hornos for these months, given in Route 1,083, to lat. 15° S., long. 20° W., at which point it is crossed by the track from the Cape of Good Hope to North American ports (Route 1,045 (1); join this route and follow it to destination.

Route 1,085. Cabo de Hornos (Cape Horn) to South American (East coast) ports

At all times of the year, after rounding Cabo de Hornos, stand northward with the Falkland current between the Falkland islands and Tierra del Fuego, and carry it up the coast, with the prevailing westerly winds, to Bahia Blanca or Rio de La Plata. *See* also Note under Route 1,401.

From Rio de La Plata onwards to the northward, to Cabo Frio or Rio de Janeiro, *see* Route 1,078, and from Rio de Janeiro to Pôrto do Salvador, or Recife *see* Route 1,075.

Route 1,086. Cabo de Hornos (Cape Horn) to Cape Town

Follow Route 1,083, taking particular notice of the remarks as to ice, as far as about lat. 50° S., long. 45° W., and from this point, at all seasons steer a direct course with the prevailing westerly wind, and a favouring current to lat. 40° S., on the meridian of Greenwich; thence steer in a north-easterly direction for Cape Town. *See* the relevant part of Route 1,009 (2), Channel to Cape Town, "Equator to the Cape;" the Note and Caution under that route, dealing with the voyage after passing the meridian of Greenwich, are equally applicable to the route from Cabo de Hornos, as regards winds, currents, and the making of Cape Town itself.

Route 1,087. Cabo de Hornos (Cape Horn) past the Cape of Good Hope to Indian ocean and Australian ports

Take Route 1,086 as far as lat. 40° S., on the meridian of Greenwich, and from this point continue due East along that parallel, but from November to March a quicker passage will probably be made at about lat. 45° S., though better weather will be found at lat. 40° S.

Vessels from the North Atlantic, bound eastward around the Cape of Good Hope, also make for the meridian of Greenwich, at lat. 40° S., and the routes, from Cabo de Hornos and from the equator, meet at this point.

For the continuation onward through the Indian ocean *see* the appropriate routes from Cape Town, described in Section C., Part II, Chapter I.

Routes 1,088, 1,089, and 1,090.—*Reserved as spare.*

PART II

INDIAN OCEAN (INCLUDING THE RED SEA)

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NOTES.—The general sailing-ship route index will be found at the end of the whole of Section C. commencing on page 321.

The Winds and Weather, *Currents and Ice* of the Indian ocean and Red sea are described in Chapter I., of Section B., Part III.

SECTION C. PART II.

Chapter I

ROUTES FROM PORTS ON THE WESTERN SIDE OF THE INDIAN OCEAN

(i) ROUTES FROM CAPE TOWN OR THE CAPE OF GOOD HOPE

Route 1,091. Cape Town or Cape of Good Hope to ports in Australia and New Zealand

(1) Main Route across the Indian Ocean (*a* and (*b*)) and approach to Bass strait (*c*) for Melbourne—all seasons, or for Sydney and New Zealand—winter months).

(*a*) *Rounding the Cape of Good Hope.*—From Cape Town, vessels bound eastward are recommended to pick up the eastward track from Cabo de Hornos (Cape Horn) (Route 1,087) at the point where it is met by the track from the North Atlantic (Route 1,009) bound to the Indian ocean, namely at lat. about 40° S. and long. 20° E. There is but little difficulty in passing eastward round the Cape of Good Hope at any time, though a greater proportion of gales will be met with from April to September, the winter season.

From October to April, easterly winds prevail as far south as the tail of the Agulhas bank (about 37° S.), with variable but chiefly westerly winds beyond it. In May and September, at the tail of the bank, easterly and westerly winds are in equal proportion, but between these months westerly winds prevail, extending sometimes close in to the coast. Should a south-easterly wind be blowing on leaving Table or Simons bays, stand boldly to the south-westward until the westerly winds are reached or the wind changes to a more favourable direction. In all cases when making for the 40th parallel southward of the Cape of Good Hope, steer nothing eastward of south, so as to avoid the area south-eastward of the tail of Agulhas bank, where gales are frequent, and heavy and dangerous breaking cross seas prevail.

(*b*) *Crossing the Indian ocean.*—Having thus crossed to the southward of the (west-going) Agulhas current, and picked up the westerly winds, the best latitude in which to cross the ocean must to some extent depend on circumstances.

Vessels bound to Australian ports would make the passage at about the parallel of 39° or 40° S., but those bound to Tasmania or New Zealand, would do so at between 42° or 43; S., especially from October to March, the summer months. Between 39° S. and 43° S. the winds generally blow from some western point, and seldom with more strength than will admit of carrying sail. In a higher latitude the weather is frequently more boisterous and stormy; sudden changes of wind with squally wet weather are almost constantly to be expected, especially in the winter season. Ile Amsterdam may be seen from a distance of 60 miles in clear weather.

In summer, many vessels take a more southern route, some going as far south as the parallel of 52° S. latitude, but the steadiness and comparatively moderate strength of the winds, with the smoother seas and more genial climate north of 40° S., compensate by comfort and security for the time presumed to be saved by taking a shorter route. Tempestuous gales, sudden violent and fitful shifts of wind, accompanied by hail or snow, and terrific and irregular seas are often encountered in the higher latitudes; moreover the islands in the higher latitudes are so frequently shrouded in fog that often the first sign of their vicinity is the sound of the surf beating against them.

Caution.—*Ice.*—South-eastward of the Cape of Good Hope, midway between Kerguelen island and the meridian of Cape Leeuwin, midway between New Zealand and Cabo de Hornos (Cape Horn), and north-eastward of Cabo de Hornos, icebergs are most numerous. The periods of maximum and minimum frequency vary greatly. It may happen that while ships are passing ice in lower latitudes, others, in higher latitudes, find the ocean free of ice.

The lengths of many of the Southern ocean icebergs are remarkable; bergs of 5 to 20 miles in length are frequently sighted south of the 40th parallel, and bergs of from 20 to 50 miles in length are far from uncommon.

It may be gathered from numerous observations that bergs may, in places, be fallen in with anywhere south of the 30th parallel, that as many as 4,500 bergs have been observed in a run of 2,000 miles, that estimated heights of 800 to 1,700 feet ($243^{m}8$ to $518^{m}1$) are not uncommon, and that bergs of from 6 to 82 miles in length are numerous.

See also Chart 1241, Chapter I. of Section A. and B. (Parts I. and III.) and the South Indian ocean and Antarctic Pilots.

(*c*) *Approach to Bass strait.*

(*i*) *North of King island (recommended).*—In approaching Bass strait to make the land at Moonlight head or the light at Cape Otway, the currents must be carefully attended to, particularly during south-westerly or southerly winds; vessels have been wrecked on King island by not steering for Cape Otway. When approaching Bass strait in thick weather, or when uncertain of the vessel's position, do not reduce the soundings to less than 40 fathoms ($73^{m}2$). Soundings of 60 to 70 fathoms ($109^{m}7$ or $128^{m}0$) will be found at 25 or 30 miles westward of King island. Outside this limit the soundings deepen rapidly to over 100 fathoms ($182^{m}9$).

The high bold promontory of Cape Otway is easily distinguished by the white lighthouse on it, and by the signal station, to which all passing vessels are recommended to show their number. It is desirable to round Cape Otway at a distance of not less than 3 or 4 miles.

Note.—Directions for, and a description of, Bass strait will be found in Australia Pilot, Vol. II.

Caution. In approaching King island from the westward, especially during thick or hazy weather, caution is required on account of the variable strength of the current, which sets to the south-east with a force varying from a half to 2½ knots, according to the strength and duration of the westerly winds, and sounding is recommended.

(*ii*) *South of King island (not recommended).*—The entrance to Bass strait between King island and the Hunter group is not recommended, on account of Bell reef and Reid rocks which lie in it. If, from necessity or choice, entering Bass strait by this passage, keep to the southward of Reid rocks and Bell reef, the latter being passed at the distance of 2½ miles to the southward of it by steering for Black Pyramid on a bearing of 098°. With a commanding breeze the passage between King island and Reid rocks may be taken without danger by paying attention to the tidal streams, which set somewhat across the channel at times. From Black Pyramid pass about one mile north of Albatross islet, whence to Port Dalrymple,

See Section D. Part II. Index on pages 349 and 350.

round the sunken danger Mermaid rock, off Three Hummock island, and then make a direct course.

(2) To Fremantle.—Take passage as in (1) (a) and (b), but leave the main route across the ocean in about long. 90° E., and thence make direct for destination. Some navigators, however, recommend continuing eastward as far as long. 100° E. before turning north-eastward.

During the southern summer months, to avoid being set to the northward of Rottnest island, it is advisable to make the land about Cape Naturaliste. *See* Caution in Route 463.

(3) To Adelaide.—Take passage as in (1) (a) and (b) but leave the main route across the ocean on the meridian of Cape Leeuwin, or about long. 115° E. Thence proceed direct for Cape Borda.

(4) To Port Philip (Melbourne).—Proceed as in (1) (a) and (b) until reaching long. 135° E. and thence direct for Bass strait. *See* (1) (c).

Should Cape Otway be rounded early in the evening, with a fresh southerly wind, beware of overrunning the distance, as a strong current after a prevalence of southerly gales, often sets north-eastward along the land; bearings of Eagle Nest light give a good check. When abreast of Eagle Nest point lighthouse, if there is not sufficient daylight to get into pilot waters, stand off and on shore till daylight, not shoaling the water to less than 20 fathoms ($36^{m}6$). *Do not heave to.*

(5) To Sydney.—In all seasons first take passage as in (1) (a) and (b). After reaching the longitude of Australia, there is a summer and a winter route as follows:—

(a) Summer route.—Leave the main route across the Indian ocean at about the 120th meridian E. and steer to pass round the south of Tasmania.

After rounding South cape, give a berth of 20 or 30 miles to Cape Pillar and the east coast of Tasmania, to escape the baffling winds and calms which frequently perplex vessels inshore, while a steady breeze is blowing in the offing. This is more desirable from December to March, when easterly winds prevail, and a current is said to be experienced off the south-east coast at 20 to 60 miles from the shore, running northward at the rate of three-quarters of a knot, while inshore it is running in the opposite direction, with nearly double that rate. From a position about 30 miles eastward of Cape Pillar, proceed on a course of about 012° for about 350 miles to a position 15 miles eastward of Cape Howe, whence continue as directly as possible to make Sydney, but keeping at first at a distance from the coast, in order to lessen the strength of the south-going Australian coast current, not closing the land till northward of South head, Port Jackson.

Some navigators prefer to stand eastward into long. 155° E., before turning northward for Port Jackson, and thus escape almost altogether the southerly set.

(b) Winter months.—Follow (4) above to Cape Otway in Bass strait. From a position off Cape Otway steer to pass about 2 miles south of the Anser islands, 3 miles north of Rodondo, and 2 miles south of South East point, Wilson promontory. Then steer to pass about 5 miles south-eastward of Rame head and Gabo island. Occasionally and especially during and after easterly gales the current sets strongly towards the land; in thick weather sounding must not be neglected. *See* Navigational Notes on Bass strait under Route 1,234 (1) (a).

From Rame head stand on to the eastward to about long. 154° E., before turning to the northward, in order to escape from the southerly set of current along the coast of New South Wales, and approach Port Jackson from a point slightly to the northward. During easterly gales (June to August), an offing may be maintained by watching the shifts of wind, and keeping on the southward tack as long as prudent, thus bringing the prevailing south-going current on the lee bow.

(6) To Hobart, Tasmania.—First take passage as in (1) (a) and (b) and leave the main track at about the meridian of 120° E.; then steer for a point 10 miles southward of South West cape, Tasmania; or in any case far enough to the south to avoid falling in with its rocky western coast in the night through any error in the reckoning, or being caught on a lee shore by a south-west gale. In fine weather, from 10 miles southward of the South West cape, Tasmania, pass between Maatsuyker islets and the Mewstone, then steer to pass 3 miles southward of South cape. When blowing heavily from the south-west or southward, especially if unable to obtain observations before making the land, it is desirable to keep more to the southward, passing south of the Mewstone and on either side of Piedra Blanca and the Eddystone, taking care to avoid Sidmouth rock. Proceed to Hobart through Storm bay.

(7) To ports in New Zealand.—Proceed as in (1) (a) and (b) until approaching the longitude of Australia, after which there is a summer, and a winter, route as follows:—

(a) Summer route.—Leave the main track at about the 110th meridian E. and proceed south of Tasmania in about lat. 45° to 47° S.; this position is also the starting point for the Main route across the South Pacific ocean. *See* Route 1,251.

(b) Winter route.—Follow (4) above to Cape Otway, and thence continue through Bass strait as in (5) (b).

In either case continue as follows:—

If bound to Auckland proceed round the northern end of New Zealand; if for Wellington, through Cook strait; and if for Otago or Lyttelton, southward of New Zealand through Foveaux strait, or in thick weather, southward of Stewart island.

Distance from the Cape of Good Hope via Hobart to Auckland is 7,440 miles; to Wellington, 7,220 miles; and to Otago, 6,970 miles.

See also Route 1,251 for the Main route across the Pacific, and Routes 1,253 and 1,254 for the through routes from South Africa to South and North America.

Route 1,092. Cape Town or Cape of Good Hope to Singapore or the China sea

Although this voyage takes a vessel out of Indian ocean waters, properly so termed, into the Eastern archipelago and China sea (which should be considered as " Pacific ocean " waters), it is treated more conveniently as a continuous voyage, and will so be considered. As the voyage is complicated not only by different routes due to monsoons, but also by several alternative channels and straits among the islands of the Eastern archipelago, the following procedure has been adopted.

The routes below give, in detail, the passage from the Cape of Good Hope as far as the southern entrances to the Eastern archipelago, and thence a summary of the various straits and passages to be navigated on the continuation of the voyage to Singapore or the China sea. A full description of these straits, etc., and directions for working through them, whether bound to the northward, or to the southward, will be found in Chapter II. of this part of Section C, commencing on page 247.

Through the Eastern archipelago there are two principal routes, and one alternative route, dependent on the monsoon prevailing in the Eastern archipelago *at the time when the vessel may be expected to arrive* from the Cape of Good Hope at the chain of islands which form the northern boundary of the Indian ocean at that point.

These routes depend also, to some extent, upon any sort of call which a vessel might desire to make in the Eastern archipelago: Singapore, Surabaya, Macassar, Ambon (Amboina), etc.

Besides these three routes via the Eastern archipelago, there is also another, named the "Great Eastern," which has been taken with great success by vessels passing the Cape of Good Hope in September. It leads southward and eastward of Australia, westward of New Caledonia, through Pioneer channel (between the Solomon islands and New Ireland), across the equator in about long. 156° E., and thence direct. *See also* Routes 1,264 and 1,265. The season of cyclonic storms in the western part of the South Pacific ocean is from December to March.

The monsoon periods, on which these routes depend are as follows:—

May to September.—A south-easterly, or easterly monsoon prevails in the Eastern archipelago, and a south-westerly monsoon (usually not strong) in the China sea.

October to March.—A north-westerly, or westerly monsoon prevails in the Eastern archipelago, and a north-easterly monsoon (the latter usually strong) in the China sea.

The Routes.—The object of a vessel bound to the China sea being to get as far to windward as possible in the Indian ocean before arriving in the monsoon area, she would make for the western end of the island chain during the westerly and south-westerly monsoon period (May to September); and for the Eastern passages of the chain during the easterly and north-easterly monsoon period (October to March). The alternative route to the China sea, above referred to, is suitable only to the months of October and November, and passes through the central part of the island chain.

The following variations to the above are not infrequently taken though they do not appear to possess any particular advantage.

Though the October to March route to the China sea is usually made by the eastern passages through the islands, it is possible to make it by passing through Soenda (Sunda) straat, the western passage; and then proceeding to the northward through the China sea along the northern coast of Borneo (known as the "Palawan passage", *see* Navigational Notes under Route 1,303); or else, after passing Soenda straat, to stand to the eastward through the Java sea to the eastern passages.

Vessels bound only to Singapore use the western passage through Soenda straat at all times of the year.

Vessels bound to ports on the east coast of Borneo, or in Macassar strait, etc., use either the Soenda straat or the Central passages (Bali straat, Lombok straat, or Alas straat).

The Central passages could also be used, during the North-West Monsoon period, instead of the passage through the islands further to the eastward; and then standing eastward to pick up the regular Eastern route.

(1) To SINGAPORE.

(a) May to September.—Take the main route from Cape of Good Hope across the Indian ocean, as described in Route 1,091 (1) (a) and (b), along the parallel of 39° or 40° S., as far as about long. 75° E. From thence edge away to the north-eastward, crossing lat. 30° S. in long. 100° E., or thereabouts; and lat. 20° S. in long. 105° E., passing close westward of Christmas island, and up to Java hoofd (head) (the eastern entrance point of Soenda straat from the southward). Care must be taken to keep well to the eastward, especially in June, July, and August, when the South-East Monsoon and the west-going current are at their strongest, or the vessel may fall to leeward of Java hoofd and find great difficulty in recovering it against wind and current. Continue as in (c) next column.

(b) October to March.—Leave the main route from the Cape across the Indian ocean at about long 75° E. as in (a), and steer to cross lat. 25° S. at long. 98° E., and thence directly northwards for Soenda straat, passing midway between Christmas and Cocos or Keeling islands, and steering for Vlakke (Flat) hoek, on the west side of Soenda straat, as in this season the east-going current is strong, and westerly winds blow at times with considerable strength. If contrary winds are met with after passing St. Paul island, stand northward, through the South-East Trade, into the North-West Monsoon, and from thence direct to Soenda straat, and continue as in (c) below.

Note.—During the changes of monsoons, March, April, and September-October, it is advisable to make easting until Java hoofd bears 000°, and then steer directly for it.

(c) Continuation of (a) and (b) to Singapore.—The three alternative passages between the islands from Soenda straat are given in (i), (ii), and (iii) below in a summarised form. A detailed description of the straits mentioned and directions for working through them will be found in Chapter II. of this Part of the book, commencing on page 247.

> *(i) Usual route.*—Proceed through Soenda straat, Banka straat, and Riouw straat into Singapore strait. *See* Route index in Chapter II. of this Part.
>
> *(ii) First Alternative route.*—Proceed through Soenda straat, Gaspar straten, and then either by Riouw straat to Singapore; or else from Gaspar straten continue northward, to the eastward of Bintan island and through Singapore strait, from the eastern entrance to Singapore road.
>
> *See* Eastern Archipelago Pilot, Vol. IV. for a description of dangers eastward of Bintan.
>
> *See* Route index as in (i).
>
> *(iii) Second alternative route.—October to March only.*—This route to Singapore known as the "*Inner Route*" should be taken between October and March, when the North-East Monsoon is blowing strong in the China sea, when, having passed either through Banka straat, or Gaspar straten, a vessel is confronted by a head wind, a heavy sea, and an adverse current in attempting to make the southern entrance to Riouw (Rhio) straat.
>
> Proceed via Soenda straat, Banka straat, Berhala straat, Doerian straat *(See* Route 1,124 (b) for alternative), and Singapore strait.
>
> *See* Route index as in (i) above.

(2) To CHINA SEA.

(a) May to September.—Via Soenda straat.—Take (1) (a) above as far as Soenda straat and thence proceed by one of the following routes.

(i) Most direct route.—Pass through Soenda straat, Banka or Gaspar straten, and thence between the Anamba and Natuna islands into the China sea; thence between Paracel islands and Macclesfield bank to Hong Kong. Gaspar straten offers a more direct route than Banka straat, but in thick weather Banka straat can be navigated without risk, and should be taken rather than Gaspar straten, which cannot then be approached with safety.

(ii) Palawan passage route.—When the North-East Monsoon is likely to commence before reaching Hong Kong, proceed by Gaspar straten, through Palawan passage, and along the coast of Luzon as far as Cape Bolinao; thence stand across to Hong Kong.

(iii) Karimata straat route.—Proceed from Soenda straat through Karimata straat into the China sea direct.

Although much broader than Banka or Gaspar straten, Karimata straat is not much frequented except by sailing vessels returning from China, or by vessels making to the eastward through the Java sea, as, from the effects of winds or currents, it is difficult to get through it to the westward. The great breadth of Karimata straat, compared with the others is of great advantage to vessels working; but this is partly counterbalanced by the several shoals which lie in or near the fairway and out of sight of land, as well as irregular currents, necessitating a dependence being placed on the reckoning.

(iv) Route south of Borneo.—If having passed through Soenda straat into the Java sea, the North-East Monsoon in the China sea has already begun to blow, do not attempt to make further to the northward, but at once turn eastward, and pass through the Java sea southward of Borneo to Saleier straat (between the south point of Celebes and Saleier eiland); and thence by the passage between Boeton eiland, off the south-east point of Celebes, and the islands to the southward of it, into the Banda sea; and thence through the Ceram sea into the open Pacific ocean either by Djailolo passage or Dampier straat (between Halmahera and the western extreme of New Guinea).

When in the Pacific pass eastward of the Palau islands and into the China sea through one of the channels between Luzon, the northern Philippine island, and Formosa. *See* Chapter II. of this Part of Section C.

(iv) Great Eastern passage.—For vessels leaving the Cape of Good Hope in September.—Proceed across the Indian ocean and pass southward of Australia or Tasmania as described for Sydney in Route 1,091 (5). Thence continue as summarised in the fifth paragraph of the remarks at the beginning of this route (1,092).

(b) October to March.—Via Ombai straat and " Second Eastern passage."

(i) To Ombai straat.—On leaving the Cape of Good Hope, pick up the main route across the Indian ocean at lat. 39° or 40° S., as described in Route 1,091 (1) (a) and (b) Leave the main route at about long. 75° E., and steer for the intersection of lat. 20° S. with long. 110° E. (Some navigators recommend making easting to the 90th meridian instead of the 75th before turning northward to make for the above position). From lat. 20° S. course may be directed to Ombai straat.

(ii) Second Eastern passage.—The usual and the best recommended passage through the islands, after crossing the Indian ocean from the Cape of Good Hope is that known as the Ombai straat, between the north-west point of Timor and Ombai eilanden; thence either westward of Boeroe eiland into the Ceram sea or (more usually) through Manipa straat, between Boeroe and Manipa eilanden (passing near Ambon) also into the Ceram sea. Thence through Djailolo passage or Dampier straat in to the open Pacific ocean. This route is known as the " *Second Eastern passage.*" When in the Pacific ocean, make easting between lat. 1° 30′ N. and 3° 00′ N., till able to pass eastward of the Palau islands; but after February pass westward of this group.

Having passed the Palau islands make to the north-westward to pass through Surigao strait (northward of Mindanao, in the Philippine islands) into the Sulu sea, and having passed through those waters, westward into the China sea by Mindoro strait, or Verde Island passage (southward of Luzon island), and on to Manila or to Hong Kong.

A more usual route, however, after passing the Palau islands is to stand north-west outside the Philippine islands, and then pass to the westward round the northern end of Luzon, through the Balintang channel to *Hong Kong; or, if bound to Shanghai* to stand on between the Okinawa guntō and Sakishima guntō towards the mouth of the Yangtse kiang; or more northerly still, in the full strength of the Kuro shio, north-east going current, to *Yokohama and Japan.*

Descriptions of, and directions for, the above mentioned straits and passages are given in Chapter II. of this part of Section C., commencing on page 247.

(c) October and November (only).—Via the Central passages and the " First Eastern passage."—Follow (b) (i) above as far as lat. 20° S., long. 110° E., and then turn northward to make Bali straat, Lombok straat or Alas straat.

After crossing the Java sea, pass through Macassar strait into the Celebes sea. Thence pass through Basilan strait into the Sulu sea at its south-eastern end. Pass then along the western coasts of Mindanao, Negros, and Panay islands in the Philippine islands, and enter the China sea by Mindoro strait, or Verde Island passage. Thence, work along the coast of Luzon to Cape Bojeador, before crossing the China sea to Hong Kong.

This route to China, which is known as the " *First Eastern passage,*" though often used in former days, has little to recommend it, on account of the adverse current, setting to the southward through the Macassar strait, often strongly, at all seasons of the year. The winds are boisterous and uncertain at the southern end of Macassar strait, and light and variable at the northern end, while the navigation is anxious throughout almost the whole voyage to the open China sea.

The First Eastern passage is more suitable for southward-bound traffic, and is more fully described in Chapter II. of this Part of Section C.; but in the case of vessels from the Cape of Good Hope wishing to reach ports on either side of Macassar strait, it is mentioned here.

Route 1,093. Cape Town or Cape of Good Hope to Bay of Bengal

There are three principal routes, two of which are appropriate to the South-West Monsoon and one to the North-East Monsoon.

The choice of route rests, not so much on the month in which departure is made from the Cape of Good Hope, as on the month in which a vessel may be expected to arrive in the region occupied by monsoons *(see* Section B, Part III., Chapter I.)—roughly speaking, the Indian waters northward of the equator. The month references given below for the varying routes refer, therefore, to the months of a vessel's arrival in Indian waters.

(a) May to September.

(i) Inner route.—This route via the Mozambique channel is the most direct for vessels to any port of India during the South-West Monsoon, but it must not be taken unless there is a certainty of reaching the port before the close of the monsoon.

On leaving the Cape of Good Hope, if with south-easterly winds, stand southward and run down the easting in lat. 39° to 40° S. to about long. 30° E.; if with westerly winds, run along the coast, guarding against any indraught, keeping not northward of lat. 35° S. until in long. 37° E.; then steer for Mozambique channel, passing eastward of Ile Europa and on either side of Ile Juan de Nova; pass through the Iles Comores (Comoro islands), cross the equator in about long. 54° E., thence steer direct for the Eight Degree channel, and round the south end of Ceylon up the bay. *(See* general rules for vessels navigating the Bay of Bengal at end of this route, and also Notes on navigation in the Mozambique channel under Route 1,095 (a) (i)).

(ii) First Outer route.—The following route, which is known as the *First Outer route* is more usually preferred to (a) (i) on account of ease of navigation, but must only be taken with certainty of gaining port before the end of the South-West Monsoon.

From the Cape of Good Hope take the main route across the Indian ocean, as described in Route 1,091, (1), (a) and (b), between the parallels of 39° and 40° S., as far as about long. 60° E. From this

See Section D. Part II. Index on pages 349 and 350.

point edge away to the north-eastward so as to cross lat. 30° S. at about 80° E., and from this point stand northward, as directly as possible for destination as summarised below.

Bound for Madras, or adjacent ports, cross the Equator in long. 82° E.

Bound for Calcutta, cross the Equator in long. 88° E.

Bound for Rangoon, cross the Equator as for Calcutta, but leave that route at lat. 10° N., and steer for Rangoon northward of the Andaman and Nicobar islands, past Table island, in about lat. 15° N.

See general rules for sailing vessels navigating the Bay of Bengal at the end of this route.

Note.—On the voyage northward from lat. 30° S., it is advisable to gain easting, to counteract the westerly current, and to be prepared for the wind shifting northward, for in the South-East Trade it often happens, particularly in April and May, that the wind is more from east and east-north-east than from south-east. The South-East Trade at this season extends to the equator; and from lat. 1° to 2° N. the South-West Monsoon, between May and September, is a fair wind to Calcutta or any part of the Bay of Bengal.

(b) October to March.—Second Outer route.—This route, which is known as the "*Second Outer route*," is taken when it is likely that the Bay of Bengal will not be reached before the South-West Monsoon is over, or when expecting to cross the equator between October and April, and to arrive in the bay when the North-East Monsoon has set in.

From the Cape of Good Hope, take the main route across the Indian ocean, as described in Route 1,091 (1) (a) and (b), between the parallels of 39° and 40° S., as far as about longitude 70° E. From this point, edge away at first to the north-eastward, so as to cross lat. 35° S. in about longitude 82° E., and thence stand on a straight course through the trade winds, to cross the equator in longitude 92° E.

From this point, steer to pass 150 miles westward of the north-west extreme of Sumatra, and about 60 miles westward of the Nicobar and Andaman islands, and thence as directed below:—

If the wind is westerly, give the islands a good berth, but if north-westerly, steer up the bay close-hauled. In about lat. 16° to 17° N. the wind often shifts northward, when favourable tacks may be made to the eastward.

If bound to Calcutta do not then approach either shore, but work to windward in the middle of the bay, where there is smooth water and moderate wind; from close westward of the Nicobar islands, the entrance of the Hooghly river has often been reached without tacking. If the equator is crossed late in February or in March, keep well to the westward in standing up the bay.

If bound to Madras, shape direct course from the position off the Nicobar islands.

If bound to Rangoon, leave the northward route at about lat. 3° N., and steer north-eastward, passing between Wé island and the Southern Nicobar islands as directly as possible to destination, midway between the coast of the Malay peninsula and the Andaman and Nicobar islands.

Notes:

(a) General rules for navigation in the Bay of Bengal, northward bound.

- *(i) January 15th to May 31st.*—Take the western side.
- *(ii) June, July and August.*—Keep in the middle of the bay.
- *(iii) September, October and November.*—Take the eastern side.
- *(iv) December 1st to January 14th.*—Keep the middle of the bay, and make short tacks.

See Route 1,184 for general rules for vessels southward bound.

(b) General remarks as to Cyclones.—See also Section B., Part III., Chapter I.

When running up the Bay of Bengal with a strong south-west wind, occasional squalls and rain, and a slowly-falling barometer, bad weather prevails somewhere to the northward.

Between the beginning of June and the middle of September the storm centre is probably northward of lat. 16° N., and in July or August still further northward, and a sailing vessel should steer eastward and take advantage of the southerly and south-easterly winds on the eastern side of the storm as it moves north-westward. But should the weather get rapidly bad, and the barometer continue to fall, then heave-to, and determine the position with regard to the movement of the storm before proceeding.

In May, October, or November the storm travels in some direction from west, through north, to north-east; and its course should be definitely ascertained before any attempt is made to round its eastern side, as if it is moving north-eastward such a proceeding would be attended with danger.

Route 1,094. Cape Town or Cape of Good Hope to Colombo

(a) May to September.

(i) Inner route.—Take Route 1,093 (a) (i) until through the Eight Degree channel, and thence proceed as directly as possible to Colombo.

See Notes on the navigation of the Mozambique channel under Route 1095 (a) (i).

(ii) Boscawen passage.—Take Route 1095 (a) (iii) until across the Equator in about long. 62° E. Thence steer as directly as possible to destination.

(b) April and October (these two months only).—Follow Route 1,095 (b) at first. Shortly after crossing the Equator, leave the Bombay route and steer as directly as possible to Colombo.

(c) November to March.

(i) Take Route 1,095 (c) (i) as far as the Equator and steer thence as directly as possible to Colombo.

(ii) Alternative route.—Take Route 1,095 (c) (ii) as far as the Equator; thence as in (c) (i) above.

(iii) Alternative route.—Take Route 1,093 (c) (The Second Outer route), if preferred, leaving it at about lat. 20° S., and thence steering as directly as possible to Colombo.

Route 1,095. Cape Town or Cape of Good Hope to Bombay

There are altogether six routes; three of which are available during the South-West Monsoon period, two of them during the North-East Monsoon period, and one for the months when the monsoons are changing in the Indian seas. The month references given below for the different periods refer to the expected time of arrival in Indian waters, and not necessarily to the months in which the Cape of Good Hope is left.

(a) May to September.

(i) Mozambique channel or Inner route.—This is the most direct route for vessels bound to any part of India during the South-West Monsoon, but it must not be taken unless there is certainty of reaching India before the close of the monsoon.

On leaving the Cape of Good Hope, if a south-easterly wind prevail, stand to the southward, and run down the easting in lat. 39° to 40° S. to about long. 30° E.; if a westerly wind prevail, run along the coast, guarding against any indraught, and do not go to the northward of about lat. 35° S. until in long. 37° E; when, in either case, a course may be shaped for the Mazambique channel, passing eastward of Ile Europa and on either side of Ile Juan de Nova. From thence a vessel should pass through the Iles Comores (Comoro islands), cross the equator in long. 53° or 54° E., and steer direct for Bombay.

CAUTION.—In the height of the South-West Monsoon, June, July and August, when the weather is thick and heavy, and observations very uncertain, vessels should make Bombay on the parallel of Khānderi island, and should sound frequently.

Notes on navigation in the Mozambique channel.—In this track, vessels will avoid the strongest part of the south-westerly current, and will be nearly sure of a fair wind until about half-way through the Mozambique channel, when adverse winds may be expected; should such occur, it is better to make easting on the port tack rather than westing; thus avoiding the African coast with its prevailing southerly current. The passage on the eastern side of Ile Europa is recommended, but vessels should not approach that island nor Bassas da India at night, the currents in their vicinity being very strong and uncertain.

The winds in the Mozambique channel do not blow with the same regularity that is found further north, and are generally stronger in the middle of the channel. The northerly monsoon commences between mid-September and mid-October, and the change is usually accompanied by squally weather. When near the Madagascar coast, advantage may be taken of the alternating land and sea breezes.

(ii) Passage east of Madagascar.—This passage is often preferred to the Mozambique channel, as it is less dangerous and the winds are more steady, particularly in August and September, when light variable winds are found in the Mozambique channel. This passage also must only be used when there is a certainty of reaching port before the monsoon is over.

On leaving the Cape of Good Hope, make easting in lat. 39° to 40° S. until in about long. 45° E., and thence stand to the north-eastward, crossing lat. 30° S. in about long. 53° E. From thence run through the trade, passing westward of Ile de la Réunion, the Farquhar, and Amirante islands; then cross the equator in long. 53° or 54° E., and steer direct for Bombay.

(iii) The Boscawen passage.—This passage is to be preferred to the foregoing when there is any uncertainty of reaching port before the commencement of the North-East Monsoon.

On leaving the Cape of Good Hope stand to the southward, and when in lat. 39° to 40° S. make easting to about long. 40° E. From thence stand to the north-eastward, and cross 30° S., in about 59° E., and then run to the northward, passing between Mauritius and Ile de la Réunion. After passing these islands, there are two courses; one being to join with route (a) (ii) above, at about 15° S. lat., and to continue on it to destination; the other is to stand on directly northward, through the trade wind, passing to the westward of the Saya de Malha bank. Cross the equator in about long. 62° E. and steer direct for Bombay.

In case the North-East Monsoon has commenced, get in with the coast of India after passing the Maldive islands.

(b) April and October.—During these months there is often a westerly wind experienced on leaving the Cape of Good Hope, in which case follow the directions given in (a) (i) above, but stand on to the east-north-eastward past Madagascar into the Indian ocean, making directly for a position in about lat. 15° S. and long. 70° E., passing either between the islands of Mauritius and Rodriguez, or eastward of the latter. From this point, steer to cross the equator in long. 75° E., passing to the eastward of the Chagos archipelago, and thence to the northward, eastward of the Maldive and Laccadive islands, parallel with the coast of India, to Bombay, working the land and sea breezes.

(c) November to March.—There are two routes during these months.

(i) Leaving the Cape of Good Hope, pick up the *main route* across the Indian Ocean, as described in Route 1,091 (1) (a) and (b), steering between the 39th and 40th parallel of South latitude. On reaching the meridian of 60° E., stand to the north-eastward to the intersection of lat. 35° S. with long. 70° E. From this point stand due north, through the South-East Trades to lat. 10° S., and from this point make to the north-north-eastward, so as to cross the equator in long. 80° E. and make northing into the North-East Monsoon, standing for Cape Comorin, and then work up the Malabar coast to destination, with the land and sea breezes.

(ii) The Alternative route is the same as (c) (i) above, as far as the position lat. 35° S., long. 70° E. At this point, instead of turning northward, some authorities consider it more prudent to make further easting, so as to be well to windward on reaching the North-East Monsoon, and make first for a position in about lat. 25° S., long. 80° E. From this point turn northward, run through the Trade and the North-West Monsoon, cross the equator in long. 82° to 85° E. and the track onward is as above in (c) (i), making northing into the North-East Monsoon. Then stand for Cape Comorin, and work up the Malabar coast with the land and sea breezes.

Route 1,096. Cape Town or Cape of Good Hope to Mauritius

(a) All seasons.—At all times of the year, take Route 1,095 (a) (iii) (the " Boscawen passage ") as far as lat. 25° S., and then steer direct for destination in the South-East Trade wind.

Note.—Vessels from this direction bound for Port Louis should pass eastward, and round the northern end of Mauritius, in order to avoid the calms caused by the high land near the south-west extreme of the island.

(b) Occasional route.—It may sometimes be possible to follow Route 1,095 (b) (as in April), leaving it when abreast Mauritius, which it passes at about 100 miles to the southward.

Route 1,097. Cape Town or Cape of Good Hope to Aden

There are three routes available from April to September, and one from November to March. In October either route may be taken.

(a) April to September or October.

(i) Take Route 1,095 (a) (i) as far as the equator, in long. 53° E.; and thence continue to destination, between Capo Guardafui and Socotra. Work along the northern African coast as far as Mait island, before standing across to Aden. *(See* Cautions, etc., under Route 399).

(ii) Take Route 1,095 (a) (ii), standing direct for Capo Guardafui after passing the Amirante islands and Seychelles group. Round Capo Guardafui closely, and thence steer as directly as possible to destination *(See* Cautions, etc., under Route 399).

(iii) Take Route 1,095 (a) (iii) (The Boscawen passage) to join (a) (ii) above in about lat. 15° S.

(b) October, or November to March.—Take Route 1,091 (1) (a) and (b) from the Cape of Good Hope and continue along it, between the parallels of 39° and 40° S., as far as the 60th meridian, E. long. From this point, stand northward to pass about 200 miles eastward of Rodriguez island, and to cross the equator in long. 68° E. At this point, turn to the north-westward, steering so as to cross the meridian of 60° E. at lat. 10° N. and thence, northward of Socotra, which should be given a berth of from 40 to 60 miles, to destination.

Route 1,098. Cape Town or Cape of Good Hope to Mombasa and adjacent ports

(a) Shortest route.—Take Route 1,095 (a) (i) through the Mozambique channel, but pass west of Iles Comores (Comoro islands). Thence steer direct to destination.

(b) Recommended route.—The preferable route, however (available at all seasons of the year), is eastward of Madagascar. Take Route 1,095 (a) (ii), as far as the north end of Madagascar, from which point both wind and current are favourable for Mombasa and adjacent ports.

Route 1,099.—*Reserved as spare.*

Route 1,100.—*Reserved as spare.*

(ii) ROUTES FROM PORTS ON THE EAST COAST OF AFRICA AND MAURITIUS.

Route 1,101. Durban to Australian, New Zealand, or Indian ports, to Singapore, or to the China sea

(1) To Australia or New Zealand.—Stand to the south-eastward, and pick up the Main route across the Indian ocean at long. 50° E., and from that point follow the directions given under Route 1,091 (1) (b) and (c), (2), (3), (4), (5), (6), or (7), according to destination.

(2) To Singapore, China sea or to Indian ports.—Stand to the south-eastward, and make easting in about lat. 35° S., until picking up the route to pass through the Eastern archipelago, to the Bay of Bengal, or to Bombay, according to time of year, as described under Routes 1,092, 1,093, 1,094 or 1,095.

Route 1,102. Durban to Mauritius, to East African ports, or to Aden

(1) To Mauritius.—Stand to the south-eastward, and make easting in about lat. 35° S. From about long. 50; E. keep gradually more to the northward, crossing the parallel of 30° S. in about long. 58° or 59° E., and then direct through the Trade winds to Mauritius.

(2) To Mombasa and adjacent ports.—The shortest route is by the Mozambique channel, steering first to the south-eastward across the Mozambique current, until picking up Route 1,095 (a) (i), and passing westward of the Iles Comores; but the preferable route is to proceed as in (1) above to Mauritius, and taking the route either westward or eastward to Ile de la Réunion, around the north end of Madagascar to destination, with a favourable wind and current.

(3) to Aden.—The routes are the same as from Cape Town (*see* Route 1,097), according to season, making easting to pick up those routes that are eastward of Madagascar, on about the parallel of 35° S.

Route 1,103. Durban to Cape Town

Proceed as directly as possible, keeping at a distance of about 20 miles or over from the coast. A favourable current will be carried throughout the passage.

See Notes under Route 1,110 (2), and under Route 1,174 (Navigational Note (ii)).

Route 1,104.—*Reserved as spare.*

Route 1,105. Mauritius to ports in Australia or New Zealand

(1) To Fremantle and all ports eastward (south-about) or to New Zealand.—Make southing to pick up the main track across the Indian ocean described in Route 1,091 (1) (b). Follow the appropriate part of that route to destination.

(2) To ports of northern Australia.

(a) April to October.—During the South-East Monsoon period on the north coast of Australia, stand southward, as in (1), above, and proceed by Bass strait, up the east coast of Australia, and through Torres strait to destination. *See* Route 1,266, Sydney to Torres strait.

(b) November to April.—During the North-West Monsoon period, stand northward into that monsoon and thence proceed as directly as possible to destination.

Route 1,106. Mauritius to Singapore or the China sea

Stand south-eastward or eastward to pick up Route 1,092 (1) or (2), according to destination and time of year.

Route 1,107. Mauritius to Indian ports

(a) April to October.—Route 1,095 (a) (iii) (The Boscawen passage) passes Mauritius closely, and may be followed to Bombay. If bound to the Bay of Bengal, leave the route at lat. 5° N. and pass through the Eight Degree channel, and round the south end of Ceylon to destination. To Colombo steer direct from the Eight Degree channel.

(b) November to March.—Stand eastward or south-eastward to pick up Routes 1,093 (b) for Bay of Bengal, 1,094 (c) for Colombo, or 1,095 (c) for Bombay.

Route 1,108. Mauritius to Aden

(a) April to October.—Steer to join Route 1,097 (a) (iii), which passes near Mauritius.

(b) November to March.—Run northward through the South-East Trade and the North-West Monsoon to pick up Route 1,097 (b) to destination.

Route 1,109. Mauritius to Mombasa and adjacent ports

Proceed as directly as possible, passing round the northern end of Madagascar.

Route 1,110. Mauritius to Durban or Cape Town

(1) To Durban.—Proceed as directly as possible, passing about 100 miles southward of Madagascar, and making the African coast well northward of Durban.

(2) To Cape Town.—Pass about 200 miles southward of Madagascar and make the African coast about 200 miles south-westward of Durban, afterwards keeping in the strength of the Agulhas current until abreast of Mossel bay; from thence, steer direct to round Cape Agulhas at a prudent distance.

Note.—When nearing the Cape of Good Hope with strong westerly winds, keep on the Agulhas bank, not more than 40 or 50 miles from the coast, where will be found smoother water than elsewhere. (*See* Navigational Note (ii) and Caution under Route 1,174.

Route 1,111. Mombasa and adjacent ports to Aden

(a) April to October.—Keep along the coast in the strength of the current and pick up Route 1,097 (a) (1), Cape Town or Cape of Good Hope to Aden, in about lat. 10° N.

(b) November to March.—Work to the eastward into the North-West Monsoon keeping as far northward as the wind will permit until that monsoon is reached; then run east, edging northward at the latter part, as far as about long. 68° E., when stand northward into the North-East Monsoon, and from thence direct for the Gulf of Aden. The same route may be taken from the Seychelles.

Socotra should be weathered if possible. If efforts are only made to pass southward of it, and the monsoon happens to be fresh, there is a great chance of being swept to leeward of Capo Guardafui. If leaving Mombasa in March, a vessel should not go eastward of the Seychelles before standing to the northward, as southerly winds might be expected before reaching Capo Guardafui.

Route 1,112. Mombasa and adjacent ports to Bombay

(a) April to October.—Keep along the coast in the strength of the current to about lat. 5° N. and thence steer as directly as possible to Bombay. *See* Caution after Route 1,095 (a) (i).

(b) November to March.—Work to the eastward into the North-West Monsoon, then run to the eastward on about the parallel of 5° S. until in long. 82° or 84° E., when stand to the northward across the equator into the North-East Monsoon, and make the south end of Ceylon, and then Cape Comorin; thence work up the Malabar coast with the land and sea breezes.

In March it would perhaps be better to go direct when the North-West Monsoon is met with as northwesterly winds are prevalent in the Arabian sea at the end of the North-East Monsoon.

Route 1,113. Mombasa and adjacent ports to Colombo or Calcutta

(a) May to September.—Stand eastward on the starboard tack, and make for the Eight Degree channel if bound to Colombo, or pass through the more direct route offered by the Kardiva channel; but not at night, unless the entrance has been made before dark, or the latitude of the vessel is accurately known. If bound to Calcutta, pass round the south of Ceylon and pick up the Bay of Bengal route from the Cape of Good Hope (Route 1,093 (a) (ii), with Note). *See* also Notes (a) and (b) at the end of Route 1,093.

(b) October to April.—The route passes closely southward of the Seychelles islands. On leaving Mombasa, keep northward of the direct route to Seychelles, while working eastward until the North-West Monsoon is picked up, which may be expected after passing long. 45° E., but is very uncertain. Light winds and calms render this generally a tedious passage.

After passing the Seychelles islands, and if bound to Colombo, run to the eastward in about lat. 5° S., cross the Equator in from 82° to 84° E., and stand to the northward into the North-East Monsoon, when make for and round the south-western end of Ceylon; then work up the coast, taking advantage of the land and sea breezes. If bound to Calcutta, continue to make easting until the route from the Cape of Good Hope to Calcutta is picked up in about long. 92° E., and follow it to destination. (*See* Route 1,093 (b), and Notes (a) and (b) at the end of the route).

Route 1,114. Mombasa to Mauritius and Australia

In all seasons the route to Australia is taken via, or passing close to, Mauritius.

(1) To MAURITIUS.

(a) April to October.—Stand to the eastward, regardless of crossing the equator in so doing, until eastward of the Chagos group, when southing should be made into the trade wind, and then a direct course steered for Mauritius.

(b) November to March.

(i) Recommended route.—Make easting with the North-East and North-West Monsoons and cross lat. 10° S. in about long. 70° E., and from thence steer direct through the Trade wind for Mauritius. Vessels should keep northward of a line drawn from Zanzibar to the Seychelles until in the North-West Monsoon.

(ii) Alternative route.—The alternative route at this season is to stand down through the Mozambique channel, taking advantage of the current on the African coast. Then, from the southern end of the channel, stand south-eastward into the westerly winds and make easting southward of the 35th parallel. Recross lat. 30° S. in about long. 58° or 59° E., and then make direct for Mauritius through the Trade.

CAUTION.—This being the cyclone season, the first route is the safer as the path of these cyclones is then more easily avoided.

(2) To AUSTRALIA.—Take Route 1,105 to Australia, after calling at, or passing close to Mauritius as described in (1) above.

Route 1,115. Mombasa to Durban or Cape Town

At all seasons of the year proceed as directly as possible, keeping in the strength of the Mozambique and Agulhas currents. *See* Notes for the Mozambique channel and for rounding the Cape of Good Hope in Route 1,110 and 1,174.

Routes 1,116 to 1,120 Inclusive.—*Reserved as spare.*

See Section D. Part II. Index on pages 349 and 350.

Chapter II

ROUTES NORTHWARD OR SOUTHWARD BOUND THROUGH THE EASTERN ARCHIPELAGO

GENERAL REMARKS

The channels between the islands of the Eastern archipelago and of the Philippines form one of the main connecting links between the Indian and Pacific oceans.

This chapter contains a brief description of the principal straits of the Eastern archipelago and those through and around the Philippine islands, and also directions for working through them, both northward and southward bound. The description of the passages through the Indian ocean and the China sea, for approaching or leaving the Eastern archipelago, will be found in other chapters of Parts II. and III. of Section C., and these contain ample references to the routes described in this chapter.

This chapter is divided into two main sections. Section A deals with the northbound routes, and Section B. with the southbound routes. Each of these sections deals with the routes through (i) Soenda (Sunda) straat; (ii) Ombai straat; (iii) Bali, Lombok and Alas straten. In (i) is included a description of the western and eastern approach to Singapore, to assist a vessel taking a through route to or from the China sea via the Eastern archipelago or the Malacca strait.

The following two indexes may be useful for ready reference to any part of any passage through the Eastern archipelago, and in planning passages to ports within the archipelago, which are not mentioned in any of the main routes. The first index is alphabetical and consists of a list of many of the seas and straits in the Eastern archipelago and the Philippine islands; it gives also the following information:—(a) The route in which a description of the strait appears; (b) and (c), Directions for the passage through the strait, bound northward or southward. The second index shows the through routes of the Archipelago in either direction.

See also the General Sailing-ship Route index at the end of Section C.

INDEXES TO CHAPTER II

(1) INDEX TO STRAITS (*See* GENERAL REMARKS)

Name of Strait	*Description*	*Route number*	
		Northward bound	*Southward bound*
Abang straat	—	1124 (b)	—
Alas straat	1140 (3)	1140 (3)	1158
Bali straat	1140 (1)	1140 (1)	1158
Balintang channel	1138 (4) (a)	1138 (4) (a)	1151 (a)
Banka straat	1123	1123	1145
Bashi channel	1138 (4) (b)	1138 (4) (b)	1151 (b)
Basilan strait	1142 (1)	1142 (1)	1142 (1)
Berhala straat	—	1126 (1) and (2)	1126 (1) and (2)
Boeton (Buton) passage	1133	—	—
Ceram sea	1137	1137	—
Clement channel	1128 (3)	1128 (3)	1146 (3)
Dampier straat	1137	1137	1152 (b)
Djailolo passage	1137	1137	1152 (a)
Doerian straat	—	1126 (3)	1126 (3)
Gaspar straten	1128	1128 and 1129	1146
Karimata straat	—	1132 (2)	1147
Lombok straat	1140 (2)	1140 (2)	1158
Macassar strait	1141	1141	1141
Macclesfield channel	1128	1128 (1)	1146 (2)
Manipa straat	1136 (2)	1136 (2)	1153 (1)
Mindoro strait	1155	1155	1155
Molucca sea	—	—	1152 (c)
Ombai straat	1136 (1)	1136 (1)	1153 (2)
Pengelap straat	—	1124 (b)	—
Riouw (Rhio) straat	1125	1125	1144
Saleier straat	1133	—	—
San Bernardino strait	1138 (2)	1138 (2)	—
Sapoedi straat	1157	—	—
Sibutu passage	1156	—	1156
Singapore strait	1127 (also contains directions bound eastward or westward)		
Soenda (Sunda) straat	1121 (1)	1121 (2) and Notes	1149
Stolze straat	1128	1128 (2)	1146 (3)
Sulu sea	1142 (2)	1142 (2)	1142 (2)
Surigao strait	1138 (1)	1138 (1)	—
Verde Island passage	1138 (3)	1138 (3)	—

ROUTES THROUGH THE EASTERN ARCHIPELAGO

This index is intended to facilitate the selection of the best route through the Eastern archipelago, but the remarks at the beginning of this chapter, and of " B " of this chapter on page 269, should be noted. The remarks at the beginning of Route 1,092 (page 240) should also be read.

The season during which each route should be taken is stated.

(1) Soenda (Sunda) straat to Singapore

(a) Via Banka straat and Riouw (Rhio) straat. (Usual route, though principally May to September).

	Route	Page
(i) Soenda (Sunda) straat.—Description and directions ...	1121	252
(ii) Soenda straat to Banka straat	1122	253
(iii) Banka straat.—Description and directions	1123	254
(iv) Banka straat to Riouw (Rhio) straat. *See* also (c) below...	1124 (a)	255
(v) Riouw straat.—Description and directions	1125	255
(vi) Singapore strait.—Description and directions to Singapore .	1127 (1) (a) (i) and (ii)	257,258

(b) Via Banka straat, Berhala straat and Doerian straat. " The Inner Route." (October to March; *see* also (c) below).

(i)	1121	252
(ii) As for (a) (i), (ii), and (iii) above	1122	253
(iii)	1123	254
(iv) Banka straat to Berhala straat	1126 (1)	256
(v) Berhala straat to Doerian straat	1126 (2)	257
(vi) Doerian straat.—Directions	1126 (3)	257
(vii) Singapore strait.—Descriptions and directions to Singapore	1127 (2) (a) and (b)	258,259

(c) Via Banka straat, Berhala straat, Pengelao or Abang straat, and Riouw straat. See (a) (iv) and (b) above. (December, January and February).

(i)	1121	252
(ii) As for (a) (i), (ii), and (iii) above	1122	253
(iii)	1123	254
(iv) As for (b) (iv) above	1126 (1)	256
(v) Berhala straat to Riouw straat via Pengelap or Abang straat	1124 (b)	255
(vi) As for (a) (v) above	1125	255
(vii) As for (a) (vi) above	1127 (1)(a) (i) and (ii)	257,258

(d) Via Banka straat and eastward of Bintan. (Alternative May to September).

(i)	1121	252
(ii) As for (a) (i), (ii), and (iii) above	1122	253
(iii)	1123	254
(iv) Banka straat to Singapore strait passing eastward of Bintan	1130 (1)	261
(v) As for (a) (vi) above	1127 (1) (a) (i) and (ii)	257, 258

(e) Via Gaspar straten and Riouw (Rhio) straat. (Alternative May to September).

(i) As for (a) (i) above	1121	252
(ii) Soenda straat to and through Gaspar straten	1128	259
(1) Through Macclesfield channel	1128 (1)	259
(2) Through Stolze straat	1128 (2)	260
(3) Clement channel	1128 (3)	261
(iii) Gaspar straten to Riouw straat	1129	261

Note.—A vessel that, having passed through Gaspar straten, finds that the North-East Monsoon is blowing strongly in the China sea, should steer as directly as possible for Berhala straat and continue thence as in (b) (v), (vi) and (vii).

(iv) As for (a) (v)	1125	255
(v) As for (a) (vi)	1127 (1)(a) (i) and (ii)	257,258

(f) Via Gaspar straten and eastward of Bintan. (Alternative to (e) above).

(i) As for (a) (i) above	1121	252
(ii) As for (e) (ii) above	1128	259
(iii) Gaspar straten to Singapore strait eastward of Bintan ...	1130 (2)	262
(iv) As for (a) (vi)	1127 (1) (a) (i) and (ii)	257,258

(2) Soenda straat to the China sea.

See also Route 1,092 (2) (a) (page 240)

(a) Via Banka straat. (May to September).

(i) As for (1) (a) (i) and (ii)	1121	252
(ii)	1122	253
(iii) Banka straat to the China sea	1131	262

(b) Via Gaspar straten.—Alternative to (2) (a).

(i) As for (1) (a) (i)	1121	252
(ii) As for (1) (c) (ii)...	1128	259
(iii) Gaspar straten to the China sea	1131	262

Soenda straat to the China sea.—*continued*

	Route	Page
(c) *Via Karimata straat.* (May to September).		
(i) As for (1) (a) (i)	1121	252
(ii) Soenda straat to Karimata straat	1132 (1)	262
(iii) Karimata straat.—Directions	1132 (2)	262
(iv) Karimata straat to the China sea	1132 (3)	263
(d) *Eastward through the Java sea.* November to February only. *Note.*—Vessels that, having passed through Soenda straat into the Java sea, find that the North-West Monsoon in that sea or the North-East Monsoon in the China sea have begun, are advised to take this route.		
(i) As for (1) (a) (i)	1121	252
(ii) Soenda straat to Ceram sea to join the " Second Eastern passage." (*See* (3))	1133	263
or		
Soenda straat to Macassar strait to join the " First Eastern passage " (*See* (4))	1133	263
Note.—In Route 1133 a description of Saleier straat and of Boeton (Buton) passage, is included.		

(3) Ombai straat to the China sea. " The Second Eastern passage."

(October to March)

See Sub-section " A " (ii) of this chapter (page 263) and Route 1092 (2) (b) (ii) (page 242).

	Route	Page
(a) *Ombai straat.*—Description and directions	1136 (1)	264
Ombai straat to the Ceram sea	1136 (2)	264
Manipa straat.—*See* Note at end of route	1136	264
(b) *Ceram sea to, and through, Djailolo passage, Dampier straat or the Molucca sea to the Pacific ocean*	1137	264
(c) *Dailolo passage, Dampier straat, or Molucca sea to the China sea*	1138	265
(i) Surigao strait.—Description and directions	1138 (1)	265
(ii) San Bernardino strait.—Description and directions ...	1138 (2)	265
(iii) Verde Island passage.—Description and directions ...	1138 (3)	266
(iv) Eastward of the Philippine islands to the China sea ...	1138 (4)	266
(a) Balintang channel.—Description	1138 (4) (a)	266
(b) Bashi channel.—Description	1138 (4) (b)	266

(4) The Central passages (Bali, Lombok or Alas straten) to the China sea. The " First Eastern passage."

(*October and November only*)

See the remarks at the beginning of sub-section " A " (iii) of this chapter on page 266.

	Route	Page
(a) *Bali straat.*—Description and directions	1140 (1)	266
Lombok straat.—Description and directions	1140 (2)	266
Alas straat.—Description and directions	1140 (3)	267
(b) *Through the Java sea and Macassar strait to the Celebes sea* ...	1141	267
Macassar strait.—Description and directions included in above.		
(c) *Celebes sea to China sea*	1142	268
(i) Basilan strait.—Description and directions	1142 (1)	269
(ii) The Sulu sea.—Description—Winds—Currents	1142 (2)	269
(iii) Verde Island passage.—*See* (3) (c) (iii) above	1138 (3)	266
(iv) Mindoro strait.—Description and directions	1155	273

(5) Northern Australia to Singapore

See Part II, Chapter IV.

(6) Singapore to Soenda (Sunda) straat.

See the General remarks at the beginning of sub-section " B " (i) of this chapter on page 269.

	Route	Page
(a) *Via Riouw straat and Banka straat* (November to April.)		
(i) Singapore strait to Riouw straat.—(1) (a) (vi) above reversed.	1127 (1) (a) (i) and (ii)	257, 258
(ii) Riouw straat.—Description (Route 1125) and directions...	1144	270
(iii) Banka straat.—Description (Route 1123) and directions for approach and passage	1145	270
(iv) Banka straat to Soenda straat	1148	271
(v) Soenda straat.—Description (Route 1121) and directions.	1149	271
(b) *Via Riouw straat and Gaspar straten.* (October to April).		
(i) As for (6) (a) (i)	1127 (1) (a) (i) and (ii)	257, 258
(ii) As for (6) (a) (ii)...	1144	270
(iii) Gaspar straten.—Description (Route 1128) and directions for approach and passage	1146	270, 271

Singapore to Soenda (Sunda) straat—*continued*

	Route	Page
(1) Approach from the northward	1146 (1)	270
(2) Macclesfield channel.—Directions	1146 (2)	271
(3) Stolze straat and Clement channel.—Directions ...	1146 (3)	271
(iv) Gaspar straten to Soenda straat	1148	271
(v) As for (6) (a) (v)...	1149	271
(c) Via Doerian straat, Berhala straat and Banka straat.—The "Inner route" (October to April).		
(i) Singapore strait to Doerian straat (1) (b) (vii) above reversed	1127 (2) (a) and (b)	258
(ii) Doerian straat.—*See* Route 1126 (3)	1126 (3)	257
(iii) Doerian straat to Berhala straat.—*See* Route 1126 (2) ...	1126 (2)	257
(iv) Berhala straat to Banka straat.—*See* Route 1126 (1) ...	1126 (1)	256
(v) As for (6) (a) (iii)	1145	270
(vi) As for (6) (a) (iv)	1148	271
(vii) As for (6) (a) (v)...	1149	271
(d) East of Bintan and via Karimata straat or Gaspar straten.—The "Outer route." (May to September).		
See General remarks at the beginning of sub-section "B" (i) of this chapter, on page 269.		
(i) Eastward from Singapore.—Reverse of Route 1127 (1) (a) (ii) and (i)	1127 (1) (a) (ii) and (i)	257, 258
(ii) Karimata straat.—Approach and passage	1147	271
or		
Gaspar straten.—As for (6) (b) (iii) above	1146	270, 271
(iii) Karimata straat or Gaspar straten to Soenda straat ...	1148	271
(iv) As for (6) (a) (v)...	1149	271

(7) China sea to Soenda straat. (Western Route)

See General remarks at the beginning of sub-section "B" (i) on page 269.

	Route	Page
(a) Via Anamba islands and Banka straat. (November to April).		
(i) Banka straat.—Approach to, and passage through ...	1145	270
(ii) Banka straat to Soenda straat	1148	271
(iii) Soenda straat.—Passage through	1149	271
(b) Via Anamba islands and Gaspar straten (October to April).		
(i) Gaspar straten.—Approach to, and passage through ...	1146	270, 271
Approach from northward	1146 (1)	270
Macclesfield channel.—Passage through	1146 (2)	271
Stolze straat and Clement channel ...	1146 (3)	271
(ii) Gaspar straten to Soenda straat	1148	271
(iii) Soenda straat.—Directions from northward	1149	271
(c) Via Palawan passage and Borneo coast and Gaspar straten. (May to September).		
See General remarks at the beginning of sub-section "B" (i) of this chapter on page 269.		
(i) } As for (7) (b) above	1146	270, 271
(ii) }	1148	271
(iii) }	1149	271
(d) Via Palawan passage and Borneo coast and Karimata straat. (May to September).		
(i) Karimata straat.—Approach to, and passage through ...	1147	271
(ii) Karimata straat to Soenda straat	1148	271
(iii) Soenda straat.—Directions from northward	1149	271

(8) China sea to the Indian ocean by the "Eastern Route," via Ombai straat or by either Alas, Lombok or Bali straten

(Middle of May to end of July).

See General remarks at the beginning of sub-section "B" (ii) of this chapter on page 272.

	Route	Page
(a) China sea to Pacific ocean passing northward of the Philippine islands.		
(i) Via Balintang channel	1151 (a)	272
(ii) Via Bashi channel	1151 (b)	272
(b) Pacific ocean to the Ceram sea	1152	272
(i) Via Djailolo passage	1152 (a)	272
(ii) Via Dampier straat	1152 (b)	272
(iii) Via Molucca sea	1152 (c)	273
(c) Ceram sea to Indian ocean	1153	273
(i) Manipa straat.—Description and directions	1153 (1)	273
(ii) Ombai straat.—Description, *see* Route 1136. Directions .	1153 (2)	273
or		
(iii) Through Alas, Lombok or Bali straten	1158	274

(9) China sea to Indian ocean by the " Central Route "
(May only).

See General remarks at the beginning of sub-section " B " (iii) of this chapter on page 273.

	Route	*Page*
(a) China sea to Sulu sea	1155	273
(i) Via Mindoro strait, or	1155	273
(ii) Via Verde Island passage	1138 (3)	266
(b) Sulu sea to Macassar strait	1156	273
(i) Through Sulu sea	1142 (2)	269
(ii) Basilan strait.—Directions, or	1142 (1)	269
Sibutu passage.—Description and directions	1156	273
(iii) Across the Celebes sea to Macassar strait...	1156	274
(c) Through Macassar strait and Java sea to the Indian ocean ...	1157	274
(i) Macassar strait.—Direction and directions	1141	267, 268
(ii) Java sea.—Passage through	1157	274
Sapoedi straat.—Description	1157	274
(iii) Java sea to the Indian ocean.		
Via Soenda straat	1158 (1)	274
Via Alas straat	1158 (2)	274
Via Lombok straat	1158 (3)	274
Via Bali straat	1158 (4)	274

"A." NORTHWARD BOUND THROUGH THE EASTERN ARCHIPELAGO

(i) ROUTES NORTHWARD FROM STRAAT SOENDA (SUNDA STRAAT)

Route 1,121. Approaches to, and passage through, Soenda straat

In this route, a general description of the strait is given first, followed by directions for the passage from the Indian ocean to the Java sea. In the former, reference is made to the winds, sea and tidal streams to be expected; the navigational notes which follow the latter provide more detailed directions for sailing-vessels working through the strait.

Note.—Routes northward from Soenda straat to Singapore are for use at all seasons of the year; those for the China sea are, with the exception of Route 1,133, for the period of the south-easterly monsoon, May to September. Routes between October and March are described in sub-section (ii) and (iii) of this Section (A).

(1) GENERAL DESCRIPTION OF SOENDA STRAAT.—Winds.—Sea.—Tidal streams.

(a) General description.—Soenda (Sunda) straat, the principal connection between the Indian ocean and the Java sea, separates the large islands of Java and Sumatra. The western entrance, between Java hoofd, the western extremity of Java, and Ujong Tjoekoe Redak in Sumatra, about 57 miles north-westward, is very deep in the southern part, but in the northern part a bank with depths of about 30 fathoms (54$^{\text{m}}$9) and less extends for 25 miles southward from the southern end of the Benkoelen (Benkulen) peninsula, when it falls suddenly into depths of over 100 fathoms (182$^{\text{m}}$9). In the middle of this entrance there are depths of over 600 fathoms (1097$^{\text{m}}$3), but inside the strait the depths decrease rapidly, and there are not more than about 50 fathoms (91$^{\text{m}}$4) between Derde (Third) punt, in Java, and the Legoendi (Legundi) eilanden, off the Sumatra shore. Channels with depths of 60 to 70 fathoms (109$^{\text{m}}$7 to 128$^{\text{m}}$0) have been scoured out by the current on either side of Dwars in den weg (Thwartway island) (*Lat. 5° 57′ S., Long. 105° 51′ E.*), thereby forming a bank with depths of under 30 fathoms (54$^{\text{m}}$9), which extends about 7 miles south-westward from the south-western side of that island.

In the outer part of the strait the bottom consists of sand and mud, and sand mixed with stone in the northern or inner portion; in the channel on either side of Dwars in den weg the bottom is sand mixed with stone and shells.

The narrowest part of the strait, about 13 miles across, is abreast Vierde (Fourth) punt, being here divided into the two channels mentioned above, each about 4 to 5 miles wide, by Dwars in den weg (Thwartway island or Sangiang).

See Eastern Archipelago Pilot, Vol. IV for a full description of Soenda straat.

(b) Winds.—Owing to the direction of the strait, which induces the winds to draw through to the northward, the westerly monsoon (October to March), blows stronger and more steadily than the easterly. The easterly monsoon begins in April, but unsettled weather, and winds shifting occasionally to south-west and north-west continue during May, June and July. In August and September the monsoon is at its height, and blows constantly between south-south-east and east-south-east, especially at night, under the coast of Java, when the land breeze comes off from the same quarter. In daytime, during these months, the sea breeze from the opposite direction will cause the wind to become unsteady on approaching the Java shore. Towards the end of October, westerly winds begin to appear, and at times blow from south-south-west to south-west; but the monsoon only becomes permanent in the latter half of November, with the wind between south-west and west-north-west. In December, the general direction is west-south-west., in January west, and in February, west-north-west. In March, the monsoon begins to abate, and the direction shifts back to west-south-west, with occasional variable winds. Calms are most frequent in March. Rain and thunderstorms are most frequent during the westerly monsoon period.

In the northern approach to the strait, more markedly on the Sumatra side, during the eastern monsoon (April to September) the sea breeze from northward in the Java sea will, in daytime, draw the wind into north-east. At such times, with an adverse tidal stream, it would be advisable for sailing vessels to anchor under the Java shore.

(c) Sea.—In December, January and February, considerable swell rolls into the strait, and the sea is heaviest when the tidal stream, combining with the prevailing south-west-going current, runs contrary to the wind. The sea is said to be calmest in March, July and November.

(d) Tidal streams.—See Eastern Archipelago Pilot, Vol. IV. in which full details are given.

(2) DIRECTIONS FOR PASSAGE (NORTHWARD) THROUGH SOENDA STRAAT.—In the east monsoon period, the passage affords most difficulty owing to the usually strong south-westerly set; therefore, when coming from the Indian ocean, make the land by the south-western extremity of Java, and thence pass through Behouden passage (Princes strait) and along the Java coast, where anchorage may be obtained if the wind and tidal streams are unfavourable. In Behouden passage do not approach within one mile of Prinsen eiland (Princes island), but the Java shore may be held fairly closely. It is not advisable to pass westward of Prinsen eiland, as there is no anchorage here, and there is the danger of being driven out of the strait again.

In the west monsoon period, make the land by Vlakke hoek (Flat cape) in the beginning of the monsoon, when northerly winds are frequently experienced; in the later part of the monsoon, and also in the transition periods, make for the middle of the strait, and thence follow the Java or Sumatra side according to circumstances, passing southward of Krakatau if taking the Java side, and between Sebesi and Seboekoe if taking the Sumatra side.

NAVIGATIONAL NOTES.

(a) Approaching Java hoofd (Java head).—Coming from the southward in the South-East Monsoon, keep well to the eastward, especially in June, July and August, when the monsoon and the west-going current are at their strongest, or the vessel may fall to leeward of Java hoofd, and find great difficulty in recovering it against wind and current.

CAUTION.—When making Java hoofd from the south-eastward in hazy weather, the appearance of the land eastward of Tanjong Goeha Kolak (Tanjong Sangian Sira), between it and Tanjong Sodong, bears much resemblance to that of the west point of Java, with the adjacent hills on Prinsen eiland (Princes island); the low isthmus, in such circumstances, not being distinguishable as such at a distance, has been mistaken for the entrance to Behouden passage (Princes channel). The 100 fathom (182$^{\text{m}}$9) line approaches within about 1½ miles of Java hoofd.

(b) Approaching Vlakke hoek (Flat cape).—Those approaching this cape, the western side of the ap-

proach to Soenda straat, will find depths of over 100 fathoms (182^{m}9) 8 to 10 miles to the westward, the 20 fathom (36^{m}6) line being about 5 to 6 miles from the cape; Sounding should be useful in thick weather, a vessel keeping in not less than the latter depth.

Tanggamoes or Keizerspiek, about 6,896 feet (2101^{m}9) high, situated about 30 miles northward of Ujong Tjoekoe Redak, and near the head of Semangka baai, and the summit of Taboean (Tabuan), 2,205 feet (672^{m}1) high, an island in the middle of the entrance to Semangka baai, are the first landmarks to be identified when approaching Vlakke hoek; the former is visible from a great distance in clear weather.

Having made a landfall, shape course to pass between Krakatau and Derde Punt (Third point), or between Sebesi and Seboekoe; the former is recommended except for those with local knowledge, and then only in daylight.

(c) Channels south or north of Prinsen eiland (Princes island).

(i) Behouden passage (Princes channel).—Behouden passage, between the north-western side of Ujong Koelon and Prinsen eiland, possesses the great advantage of affording anchorage to sailing vessels becalmed, which the channel northward of that island does not; light baffling winds and calms are experienced about the entrances to Soenda straat, occurring even in the strength of the east monsoon, and sailing vessels when unable to anchor are liable to be set back by adverse currents.

Behouden passage is entirely clear, but the Prinsen eiland side must not be approached within one mile on account of Pulau Karangdjadjar and also the coastal reef which extends from the southern side of Legon Semadang; these dangers are always marked by surf.

Working through the passage keep nearer to the Java coast than to Prinsen eiland, especially in the South-East Monsoon.

(ii) Channel north of Prinsen eiland.—This channel sometime known as " Great Channel," although the widest into Soenda straat, and much frequented, being considered free from dangers, has the disadvantage of being too deep for anchoring if becalmed; in which case a vessel may drift out of the strait with the west-going stream.

Entering Soenda straat by this channel, keep nearer Prinsen eiland, and when further in, borrow on the same, or Java, side.

The channel is recommended for the later part of the west monsoon period, and also the transition periods. *See* (1) (b) above.

(d) Passage through Soenda straat.—In this note it is presumed that a sailing-vessel will make her way through Soenda straat along the Java side, whether she has approached from the Indian ocean to make Java hoofd (Java head), or Vlakke hoek (Flat cape) or half way between the two; in the two latter cases a vessel is presumed to have passed south of Krakatau.

(i) Passage with a favourable wind.—There is not much difficulty in proceeding through the strait in the westerly monsoon period; the Java side of the strait and the channel south of Dwars in den weg (Thwartway island) being recommended. Pass about 2 miles off Vierde (Fourth) punt and between Toppers hoedje (island) and St. Nicolaas punt. Facilities for anchoring, if becalmed, are available on this route, while the channel north of Dwars in den weg is not favourable for this purpose, due to the deeper water; the two dangers, Stroom klip and Winsor klip, also lie in or near the northern, or western, channel.

(ii) Passage during the easterly monsoon.—During the easterly monsoon, when the winds are easterly and variable, and sometimes blow strong from the north-east towards midday, combined with the adverse current, possibly from 2 to 3 knots in mid-stream, renders the passage more tedious, and it becomes necessary to anchor to avoid losing ground; and therefore the coast of Java should be kept, where anchorage may be had in many places, and where the current is much weaker, and at times nil, when the south-going tidal stream is at its strongest.

A vessel having to work up may stand into Peper baai, when northward of Pasir Goendoel (Gundul) to a depth of about 8 fathoms (14^{m}6) but near Popolé on the north shore into not less than 10 fathoms (18^{m}3) to avoid Gosong Pandjang (Panjang), and into not less than 15 fathoms (27^{m}4) or 2 miles off Tjaringin (Charingin), to avoid Karang Keboea (Kebua). Northward of it the shore may be approached closer, by sounding. Approaching Catharina (Catherine) rotsen, stand into not less than 12 fathoms (21^{m}9), or one mile from the shore. Vierde punt (Fourth point) and the coast eastward is fringed by reef to the distance of one to 2 cables, but is steep-to. There is good anchorage southward of Vierde punt in about 6 fathoms (11^{m}0), and also off Anjer (Anyer) Lor eastward of the point, but it is not so good off Vierde punt itself. *See* Eastern Archipelago Pilot, Vol. IV.

Passing between Dwars in den weg and Java it is advisable to keep outside the 20 fathom (36^{m}6) line unless seeking anchorage. If closing the shore, note should be taken of the shoals and rocks shown on the charts, and described in the Eastern Archipelago Pilot, Vol. IV.; sounding should not be neglected.

Route 1,122. Soenda (Sunda) straat to Banka straat

From a position to the northward of Toppers hoedje and with a favourable wind, steer direct for Gebroeders (Two brothers), keeping the southern islet bearing less than 010° to lead eastward of Swallow bank; the islets can be passed on either side, during daylight, westward of Lynn reef, and Brouwers banken. Sjahbandar (Shahbundar) bank must not be approached into depths of less than 7 fathoms (12^{m}8).

Working northward, it will be prudent to keep on the Sumatra side and when northward of Sybrandi rif, and standing towards the shore, to tack when in a depth of 6 to 8 fathoms (11^{m}0 to 14^{m}6); the directions for clearing Swallow bank, described in the paragraph above must be noted.

After passing Gebroeders, a safe guide is to keep in depths of about 10 fathoms (18^{m}3); approaching the coast when the depths increase to 12 and 13 fathoms (22^{m}0 and 23^{m}8), and holding out when they decrease to 9 fathoms (16^{m}5). Vessels working up must give the Sumatra coast a wide berth when northward of Gebroeders.

While steam vessels are advised to pass to the eastward of the Five Fathom banks, some authorities consider that a sailing vessel, working up the coast, may pass between those banks and Arend droogte and, after passing the latter, may stand on the inshore tack to a depth of 5 fathoms (9^{m}1). It should be noted, however, that the 3 fathom (5^{m}5) line is some 14 to 15 miles from the coast in places. If making for Stanton passage a vessel should always pass east of the Five Fathom banks.

Note.—The trees between Tanjongs Boengin and Serdang and the groups on the north-west side of Tanjong Menjangan are the highest landmarks on this coast, but they should not be in sight from the deck, as abreast both points the banks extend about 14 miles off. These trees afford some guide from aloft during the westerly monsoon, which is the clear season, but would not be visible during the easterly monsoon, except on rare occasions; if this land is sighted from on deck it is a definite warning that a vessel is too far westward of her safe course.

CAUTION.—If the position of the vessel is uncertain at night, or in thick weather, it is advisable to anchor, for the depths are moderate, and the bottom good, being mud, or mud and sand.

Route 1,123. Approaches to, and passage northward through, Banka straat

In this route a brief general description of Banka straat is given first, followed by directions for Lucipara and Stanton passages, the principal channels of approach to the main strait from the southward. After this, directions for the passage northward through Banka straat are given.

(1) GENERAL DESCRIPTION OF BANKA STRAAT.—*Winds.—Tidal streams.*—Banka straat, about 120 miles in length, separates Sumatra and Banka eilanden, and has a general north-westerly and south-easterly direction. It is the best route between Soenda straat and Singapore.

The Sumatra coast, forming the western side of the strait, is low, densely wooded, and affords no conspicuous marks; the entire coast is bordered by a mud flat, narrow by the points, but extending from one mile to 7½ miles offshore, with depths of less than 3 fathoms ($5^{m}5$), in the bights. Towards the Banka side the bottom becomes harder, and even rocky. Banka eiland, forming the eastern side of the strait, in contrast to the Sumatra side, has numerous hills and mountains, and it is remarkable that, although the latter attain no great elevation, their summits are generally obscured by clouds; Muntok (*Lat. 2° 05′ S., Long. 105° 09′ E.*), at the northern entrance to Banka straat is the principal port.

Besides a few small islets and rocks in the strait, there are the Nangka eilanden, situated off about the middle of the Banka shore; nearly all of them are of coral formation.

Numerous sandbanks lie in the southern entrance, with two main channels between them, namely, Lucipara and Stanton passages; both are buoyed, and Stanton passage is lighted. Stanton passage is available for vessels of deep draught, as a least depth of 6 fathoms ($11^{m}0$) can be carried through it. There is a least depth of about 3¾ fathoms ($6^{m}9$) in the southern approach to Lucipara passage.

CAUTION.—Vessels proceeding through Banka straat should determine their position mainly by the landmarks on the Banka side. The muddy Sumatra shore is constantly undergoing change, especially in places where mangroves stand in the water; some of the points are receding, whilst others are working out. The few points can only be identified at short distances, and are easily mistaken for the so-called False points, which are observed immediately after rounding the real points. Mariners must, therefore, guard against placing any reliance on bearings taken of the Sumatra shore.

Winds.—The winds in Banka straat follow the directions of the coast, though with slight variations from the influence of the land and sea breezes; and fresh breezes may always be expected when working against the monsoon. During the latter part of the south-easterly monsoon, it frequently blows hard from the south-west. Land breezes occur at night.

Tidal streams.—A full description is given in the Eastern Archipelago Pilot, Vol. IV., but it can be noted here that, due to the variations in the predominant currents in the two monsoonal seasons, it is preferable to work north on the Banka side of the strait during the North-West Monsoon, and on the Sumatra side during the South-East Monsoon.

(2) DIRECTIONS FOR LUCIPARA AND STANTON PASSAGES.

General remarks.—The navigation of Stanton passage is difficult for sailing vessels working up at night; there are insufficient marks for fixing the vessel's position, sounding is not a trustworthy guide, and the usually strong tidal streams make the position uncertain. Lucipara passage should never be attempted at night, except in clear weather and with local knowledge, and it is not possible with adverse winds; if Lucipara is not visible at a distance of 4 miles it is advisable to anchor.

(a) Lucipara passage.—Sailing vessels working up through Lucipara passage by day can safely approach the bank extending from the Sumatra coast by sounding, but they must not stand into a depth of less than 6 fathoms ($11^{m}0$) when 5 miles southward of Eerste Punt, and in not less than 10 fathoms ($18^{m}3$) when off that point.

Lucipara (*Lat. 3° 13′ S., Long. 106° 13′ E.*) can be approached to within 3½ miles on the southern side, about 4 miles on the south-eastern side, and to within one mile on the western side. Sounding generally gives sufficient warning when standing towards the banks on the eastern side of the channel.

(b) Stanton passage.—Sailing vessels with a fair wind can follow the directions given for steam vessels. Sailing vessels working up through Stanton passage by day can approach the Dapoer eilanden within about three-quarters of a mile. The summit of the Permisan range bearing about 323° and open north-eastward of Besar light-structure leads north-eastward of Melvill bank. As soon as Tanjong Laboe bears more than 035°, vessels will remain clear of the banks on either side of the channel by keeping in depths of not less than 11 fathoms ($20^{m}1$), and they are generally marked by discoloration.

(3) PASSAGE, NORTHWARD, THROUGH BANKA STRAAT—After rounding Tanjong Lelari work up under the Banka side of the strait (*see* Tidal streams in Eastern Archipelago Pilot, Vol. IV.); the landmarks here are more conspicuous, and vessels can derive more advantage from the land winds, which are somewhat stronger and more regular under the Banka shore than in the middle of the strait.

Some sailing vessels, and even steam vessels, make use of the narrow channel between Karang Tembaga and the Banka coast, when this is feasible, as the tidal streams are more favourable there. Farther northward the coastal bank extending from Banka is fairly steep-to, and nearing the Nangka eilanden vessels must keep in depths of not less than 7 fathoms ($12^{m}8$) in order to clear the bank which surrounds these islands.

Standing over to the Sumatra side, the bights in the coast may be approached by sounding, but the points must never be approached in a depth of less than 11 fathoms ($20^{m}1$), as within this the depths decrease very suddenly. From about 5 miles eastward to 6 miles westward of Vierde punt, the coastal bank is steep-to and is very hard westward of this point. Farther westward the depths decrease regularly towards the shore, and vessels can approach it into depths of 5 fathoms ($9^{m}1$).

The passage between the Sumatra coast and Frederik Hendrik klippen can be easily negotiated by sounding; the coast there can be approached into depths of 4½ fathoms ($8^{m}2$), but vessels should tack away from the eastern side of the passage immediately the depths increase to more than 9 or 10 fathoms ($16^{m}5$ or $18^{m}3$). If taking the channel eastward of Frederik Hendrik klippen, vessels must not stand over too far towards the Banka shore, on account of the reefs lying as much as 2½ miles offshore between Tanjong Kelian and Tanjong Oelar.

Route 1,124. Banka straat to Riouw (Rhio) straat

There are two routes, one direct and the other via Berhala straat and Pengelap straat or Abang straat. The latter is recommended for the months of December, January and February; *see* also Route 1,126, Banka straat to Singapore strait via Berhala straat and Doerian straat.

The route from Banka straat to Singapore, eastward of Lingga archipel and through Riouw (Rhio) straat, is the one commonly adopted by vessels proceeding either way between Soenda straat and Singapore, as being safe, sheltered, and easily navigable; whereas the route eastward of Bintan is exposed in both monsoons, and the fairway is encumbered with many dangers, which render it necessary for vessels to keep at a considerable distance from the land. Riouw straat is available for all classes of vessels, both by day and by night. The main channel has been swept to a least depth of 9 fathoms ($16^{m}5$); using this channel pass about one mile eastward of Karas kechil. The eastern channel has been swept to a least depth of 3¾ fathoms ($6^{m}9$).

(a) Direct route.—The ordinary route for sailing vessels bound northward from Banka straat is between the Toedjoe eilanden and Saja (Saya); they may, however, pass on either side of Saja, which, being high and bold, is very convenient to make in thick weather or at night.

Note.—At night, or in thick weather, sounding may be very useful in detecting the drift caused by cross currents between the Toedjoe eilanden and the coast of Sumatra, for the depth decreases generally towards Sumatra, and increases towards those islands, but care should be taken in approaching them, as the remarkable irregularities of the currents have brought many vessels into danger. Near Sumatra a mud bottom, mixed with sand, prevails, and near the islands mud only.

From Saja keep north-eastward to a position some 12 or 13 miles north-eastward of Tanjong Djang, the south-eastern extreme of Lingga, and from thence as follows:—

(i) With a fair wind.—By day steer directly for the fairway into Riouw straat, taking particular note of the tidal stream, especially when setting strongly to the south-eastward. *See* Eastern Archipelago Pilot, Vol. IV.

Note.—At night, steer a little more to the northward to give more clearance to the shoals, and haul in for Riouw straat when the bank extending north-eastward from Mesanak has been crossed.

(ii) Working northward.—It is seldom necessary to work along near the islands from Mesanak to Korek Rapat; it is generally found advantageous to stand to the northward, in case of meeting with a north-westerly wind. But it may occasionally happen that advantage will be derived by standing towards them; in which case, when standing towards the north side of Mesanak, avoid bringing the summit of Benan on a bearing of more than 275°, which will lead northward of the extensive shoal (Magdeburg) with a least depth of 2½ fathoms ($4^{m}6$), north-eastward of the east point of Mesanak. To clear Rifleman shoal, lying 1¼ miles eastward of Benan, the eastern extreme of Mesanak must not be brought on a bearing of less than 133° true, or the northern extreme of Katang Lingga of more than 285°.

If working in towards Dempo straat, do not get to the southward of lines joining the north point of Katang Lingga and Selanga eilandjes, and the latter and Oediep (Udiep).

(iii) Standing to the westward towards Galang Baroe, tack before Karas kechil is shut in by Korek Rapat; or, further northward, to clear the shoal water between Tanjong Tjakang and Korek Rapat, when reaching a depth of 10 fathoms ($18^{m}3$); Dempo (Pulau Rondo) bearing 214° is a safe turning mark. Between Korek Rapat and Karas kechil it is possible stand into 8 fathoms ($14^{m}6$) before tacking, but care must be taken to give Karang Segoetji (Dittlof) a good berth. Karas kechil and Karas besar should be given a berth of half a mile.

From this point continue as directed in Route 1,125 (b) (i) "Passage through Riouw straat to Singapore strait." "Standing to the westward."

(iv) Standing to the eastward towards Telang, at the southern entrance of Riouw straat, be careful to give the south-eastern side of that island a berth of 2 miles, and to keep the conspicuous hill on Tanjong Poenggoeng (Punggung) the south-west extremity of Mantang, well open of Telang, bearing 304°, to avoid Hendrik Jan rif. Tanjong Poenggoeng, the south-west point of Mantang, and Ranggas (Alligator island) may be approached to a prudent distance.

For continuation through Riouw straat *see* Route 1,125, (b) (ii) "Passage through Riouw straat to Singapore strait." "Standing to the eastward."

For passage to Singapore strait from Banka straat passing eastward of Bintan eiland, *see* Route 1130 (1).

For passage from Banka straat to the China sea, *see* Route 1,130.

(b) Via Berhala straat and Pengelap straat or Abang straat.—This is really an alternative to the "Inner route" from Banka straat to Singapore strait, via Berhala straat and Doerian straat, described in Route 1,126 below, but is described briefly here as it is also an alternative route to Riouw straat. The passage through Berhala straat which is given in Route 1,126 mentioned above, is usually taken in December, January and February, when strong northerly winds prevail; there is then smooth water, good anchorage, and but little tidal stream.

To either Pengelap straat or Abang straat take Route 1,126 (3) towards Doerian straat, as far as necessary.

Pengelap straat is the wider of the two straits mentioned above. Owing to the uneven nature of the bottom the tidal streams, near spring tides, cause whirls and overfalls which are somewhat alarming to strangers; the strait is, however, clear except for the sand patch and rock on the western side of the fairway, and is easy to navigate. Approaching the strait, steer to pass about one mile or less from Alor (Allor) eilandjes, passing preferably northward of Batu Belajar (Belayar). Batu Belajar bearing 224°, and well open south-eastward of the Alor eilandjes, leads through Pengelap straat.

Abang straat between Dedap and Pengelap on the south-eastern side, and Abang kechil on the north-western side, is reduced to a breadth of about three-quarters of a mile by the reefs on either side, but is clear and deep in the fairway.

Having passed through either of the above straits, the directions for approaching Riouw straat are the same as those given in the relative part of (a) (ii) above.

Route 1,125. Passage through Riouw (Rhio) straat to Singapore strait.

(a) With a fair wind.—For sailing vessels with a fair and commanding breeze, Riouw straat offers no difficulties, and no directions are necessary beyond keeping in the main fairway, for a description of which and directions for the passage *see* Eastern Archipelago Pilot, Vol. IV.

(b) Working through Riouw straat from the southward.

(i) Standing to the westward (continuing Route 1,124 (a) (iii)).—Between Karas besar and Moeboet Laoet (East Mubut) stand into a depth of 8 fathoms ($14^{m}6$); Karas kechil well open of Karas besar is a good turning point to avoid the bank off the latter; Lobam kechil to the northward, open eastward of Moeboet Laoet, leads eastward of the bank extending southward of the latter island.

A 3¾ fathom ($6^{m}9$) patch lies about 2¼ miles eastward of Tanjong Semboetang (Sembulang); it is marked (1948) by a light-buoy. The main channel passes eastward of this patch, and when working northward do not bring the eastern extreme of Moeboet Laoet on a bearing of less than 163°, in order that the bank which extends north-westward from the island may be cleared; if intending to pass inside the 3¾ fathom (6^{m}8) patch do not cross this western limit until Tanjong Semboclang bears 287°.

Northward of Tanjong Semboelang, stand further to the westward, but keep the western extreme of Moeboet Laoet well open of Tanjong Semboelang, to clear Tjemara (Chemara) bank. Give Toendjoek (Tunjuk) a berth of about half-a-mile, and, when to the northward, keep Tanjong Semboelang well open of it, to avoid the bank eastward of Soebang Mas, and the reef east of Pentjaras (Antu).

Note.—The leading-lights on Toendjoek in line, bearing 180°, lead through the northern part of Riouw straat.

To avoid the reef about three-quarters of a mile eastward of the southern extremity of Nginang, keep Tandjoeng Saoe (Sau) light-structure well open of Nginang; and to clear the reef fringing that island, keep the east point of Saoe (Sau) well open of the point under the light-structure. After passing Saoe, in standing to the westward, keep Tandjoeng Saoe light-structure open of Saoe; this will clear Van Gogh eiland and shoals, and also the 4 fathom (7^{m}3) patch about three-quarters of a mile south-eastward of Karang Passo or Malang Orang.

Vessels are recommended to pass out of Riouw straat into Singapore strait eastward of Pan rif (or Karang Galang), which is marked by a light beacon on the north-east, and a beacon on the south-east, extremity. If it is decided, however, to pass westward of Pan rif, keep Karang Passo on a bearing of more than 180° until able to pass between Pas op klip (marked by a beacon) and Pan rif.

(ii) Standing to the eastward (continuing Route 1,124 (a) (iv)).—When nearing the Tapai eilanden, the hill on Tanjong Poenggoeng kept open of the southern point of Ranggas (Alligator island), bearing 098°, leads southward of them in about 4½ fathoms (8^{m}2), and of Rotterdam rif, in about 4 fathoms (7^{m}3); the south-western extreme of Pangkil (Pankil) kept bearing more than 325° leads westward of Rotterdam rif and other shoals south-eastward of Pangkil. To clear the bank of 4 to 5 fathoms (7^{m}3 to 9^{m}1), extending 2½ miles southward of the Tapai eilanden, keep Sioeloeng (Siulung) conspicuous hill open of the hill on Tanjong Poenggoeng bearing less than 077°, until the summit of Lobam eiland is open westward of Pangkil, bearing 327°, or more.

The south-west end of Pangkil eiland should not be approached nearer than half a mile, as its reef is steep-to; the west side may be approached to 7 or 8 fathoms (12^{m}8 to 14^{m}6), but off its northern end keep Karas kechil lighthouse open of Pangkil eiland, bearing 167°, or less, to avoid the bank with a depth of under 5 fathoms (9^{m}1), extending northwest from it.

Between Pangkil eiland and Isabella bank, stand to the eastward into depths of 8 fathoms (14^{m}6), or until Terkoelai (Terkulai) light structure bears 000°, but do not bring the north-east extreme of Pangkil eiland to bear more than 158°, or Terkoelai light structure less than 355°, to avoid Soreh riffen. Terkoelai light structure bearing 087° leads southward of Isabella bank, and the light structure on the eastern point of Tandjoeng Saoe in line with the west side of Lobam kechil, 329°, leads westward; the south-east extreme of the Lobam group, bearing less than 090° until Tandjoeng Saoe light structure bears more than 338°, leads westward of Orion reef. When northward of Orion reef do not bring the western extreme of Lobam kechil to bear more than 160° until Tanjong Taloh bears 090°, which will avoid the dangers near Karang Plasit. Tanjong Taloh is steep-to, and both it and Boeau (Bua) eiland may be approached to about 3 cables, except near the extremes of that island. Tanjong Oeban (Uban) is bold, but do not approach the shore northward of it, to Malang Djaroem (Jarum), nearer than half a mile. The rocks above water on the edge of the shore reef are useful guides.

Northward of Malang Djaroem there are depths of 7 and 8 fathoms (12^{m}8 and 14^{m}6) close to the edge of the shallow bank which fronts this part of the coast to the distance of nearly one mile, and on which there is a patch of less than 6 feet (1^{m}8) water. This bank, and also the shoal (called on some charts "Netscher") 1¼ to 1¾ miles northward of Tanjong Sebong, and Crocodile shoal, and the shoal between them, will be avoided by keeping Tanjong Saoe light structure bearing less than 205°. If the weather is hazy and Tanjong Saoe light structure cannot be made out at this distance, Malang Djaroem islet, which will be seen well clear of the extreme of the land as "Netscher" shoal is neared, must not be brought to bear more than 200° until Pan rif light-structure bears 248° or Tanjong Sebong north extreme bears 095°; a vessel will then be northward of those dangers and in Singapore strait.

Route 1,126. Banka straat to Singapore strait by the "Inner route." (To be taken between October and March).

Berhala straat forms the southern part of the inner route to Singapore, and Doerian straat the northern part; the intermediate part, between the western side of the Lingga archipel and the eastern side of Sumatra, has no specific denomination. The total distance from Berhala eiland to Singapore is about 120 miles.

The inner route is lighted and buoyed, and is available for all classes of vessels. The least depth in the fairway, from 5½ to 6 fathoms (10^{m}1 to 11^{m}0), is in the southern part, south-westward of Moetji.

Sailing vessels, bound from Banka straat to Singapore during the strength of the North-East Monsoon, frequently adopt this inner route. During the prevalence of strong northerly winds in the months of December, January and February, they will save much time doing so, for these straits have smooth water, good anchorage, and but little tidal stream, whereas on the eastern side of Lingga, at this season of the year, there is generally a heavy sea and a southerly current sometimes running at the rate of 3 knots. In Berhala straat, sailing vessels will also be greatly assisted by the squalls from the Sumatra coast.

Alternative Route.—In order to avoid the difficulty and delay sometimes experienced in getting from the northern part of Doerian straat to Singapore strait, many sailing vessels have preferred to pass from the inner route by Abang straat or Pengelap straat, into Riouw straat. It seems probable that the best passages might be made in this way, for the great depth of water in the western part of Singapore strait is often embarassing in light winds, as there is no anchorage ground on which to bring up in case of the wind failing. *See* Route 1,124 (b).

(1) BANKA STRAAT TO BERHALA STRAAT.—Having passed Frederik Henrik klippen (*See Route* 1,123 (3)), shape course for Berhala lighthouse, distant about 74 miles, avoiding the mudbank extending south-eastward of Tanjong Djaboeng (Jabong). The bank along the Sumatra coast being shelving, sounding will be the best guide, and the rule is to keep in from 5½ to 7 fathoms (10^{m}1 to 12^{m}8) water. In working, the coast may be approached with care to a low water depth of 5 fathoms (9^{m}1), observing that the bank with less depths than 5 fathoms (9^{m}1) extends nearly 13 miles south-eastward of Tanjong Djaboeng. It is possible that the mud bank off Tanjong Djaboeng is extending.

Pass through Berhala straat, using the passage southward of Berhala eiland; the channel between Berhala and Singkep Laoet is not safe as there are several rocks in it, and uncharted dangers may exist. In Berhala straat keep in from 10 to 12 fathoms (18^{m}3 to 21^{m}9), to be well clear of the bank projecting from the shore westward of Tanjong Djaboeng;

thence, in working along the coast to the westward, the bank is steep-to, and may only be approached occasionally, with care, to 8 or 7 fathoms (14^{m}6 or 12^{m}8).

(2) Berhala straat to Doerian straat.—From abreast Berhala eiland with a favourable wind, shape course to pass about 2 to 3 miles westward of Moetji (Muchi) eiland light-structure. With a working breeze, the Sumatra coast may be approached to depths of 6 or 7 fathoms (11^{m}0 or 12^{m}8), but the vessel's position must be fixed frequently, as the tidal streams are very irregular off the Djambi (Jambie) river. The mud-bank westward of Tanjong Djaboeng for a distance of 14 or 15 miles, is nearly dry at low water, spring tides, and extends 4 to 5 miles seaward; this bank may be extending yet further.

Both Speke rock and Moetji (Muchi) eiland exhibit lights at night, the former from a black iron light-beacon, and the latter from a white iron framework structure; so there is no difficulty when standing eastward; but, when nearing Moetji eiland, tack when it bears 000°, to avoid Atkin rock; it is best, however, to pass Moetji at a distance of about 2 miles, as mentioned above.

With a fair wind, having passed Moetji eiland steer for Zuid Broeder (South Brother) eiland, passing either side of it, but preferably to the eastward, which is the main channel; the summit, Djora (Jora), 1,009 feet (307^{m}5) high on Doerian (Great Durian) or Moro besar, which is visible from a considerable distance, bearing 344° is a good mark for making towards Zuid Broeder.

In working, be careful not to stand nearer to Tanjong Bakau on Baso eiland, or to Tanjong Dato, northward of it, than 2 miles; and off Amphitrite baai, between them, remember that the bank, which extends beyond a line joining these points, is steep-to, and sounding will give no warning. Excepting abreast the southern part of Kateman eiland, at about 12 miles northward of Tanjong Dato, the depths decrease more regularly towards the bank, which may from thence be approached by sounding into depths of 8 or 7 fathoms (14^{m}6 or 12^{m}8) towards Doerai (Durei) and the other near-by islands. In standing to the eastward, when abreast Tanjong Dato, do not deepen above 18 or 19 fathoms (32^{m}9 to 34^{m}8), for the ground on that side is foul and unsuitable for anchorage.

Cameleon rock is out of the fairway track, but if standing over so far to the eastward, Petong eiland summit bearing 350° or more leads well westward of it.

Note.—The approaches to Pengelap straat and Abang straat (*see* Route 1124 (b)) lie about 11 miles east-south-eastward, and about 7 miles eastward, respectively from Cameleon rock.

(3) Passage through Doerian straat to Singapore strait.

(a) Eastward of Roekan (Rukau) eilanden.—Having passed Middel Broeder (Middle Brother) eiland to the eastward, and standing towards Ooster bankan (Eastern banks), tack while Djora on Doerian eiland still bears more than 308° to avoid that bank. Having passed Noord Broeder eiland steer to pass between South Passage islet and Pelangkat eiland; in working, by keeping North Passage islet open westward of Klein Doerian (Little Durian) eiland, bearing more than 318°, Carnbee rif, about one mile south-westward of the south-eastern extremity of Doerian eiland will be avoided.

(b) Westward of Roekan (Rukau) eilanden.—If taking this route, after passing about 1½ miles westward of the Roekan (Brothers) eilanden in depths of from 10 to 14 fathoms (18^{m}3 to 25^{m}6) do not enter the strait until North Passage islet is well open eastward of South Passage islet, bearing 322°, to avoid Richardson reef. *See also* directions for avoiding Carnbee rif in (a) above.

(c) Continuation northward.—North-westward of Roekan eilanden, the two tracks in (a) and (b) above rejoin, to pass between North Passage islet and Pelangkat. Having passed these islets, the main channel runs between Middelburg and Melvill reefs; the peak of Valsche Doerian (False Durian) eiland in line with the apex of North Passage islet, bearing 159°, leads between these reefs. Thence steer to pass through Phillip channel if bound to Singapore, or to the northward and north-westward if bound into Malacca strait.

Should the channel westward of Middelburg reef be taken, the water will be found to shoal gradually towards the western shore over a bottom of soft mud, suitable for anchorage. The eastern point of Degong eiland (sometimes called Deep water point) bearing 180° leads eastward of the dangers extending off Boeroe (Buru) eiland and the islands northward, in 9 to 12 fathoms (16^{m}5 to 21^{m}9). The peaks of Klein Karimoen (Little Karimum) eiland bearing less than 325° also leads eastward of the dangers which project 3 miles from Groot Karimoen (Great Karimun) eiland.

When working to the northward after passing North Passage islet, and standing eastward, keep westward of the alignment of Manilang, the summit of Valsche Doerian eiland with the north-western extremity of Klein Doerian eiland bearing about 168°; this will avoid the reef about 1¼ miles westward of the southern extremity of Beloekar (Belukar) eiland.

Route 1,127. Passages through Singapore strait

Singapore strait is bounded on the north by the Malay peninsula and Singapore island, and on the south by the Boelan (Bulan) archipelago, and two large islands, Batam and Bintan. The entire length of the strait is about 60 miles, and its width at the western entrance about 10 miles; at the eastern entrance it is 11½ miles wide abreast Tanjong Datok, but southward of Singapore, between St. John islands and Batu Berhanti, it is only 2½ miles wide; the fairway is deep throughout.

Heavy rain squalls, during which visibility is moderate or poor, are frequently experienced in the strait; the colours and topmarks of the various beacons are then useful guides. *See* Malacca Strait Pilot for details of the local weather, and of the tidal streams in the strait.

In this route the strait is divided into two parts, eastern and western; the eastern part for vessels coming from, or going to, the China sea or the Eastern archipelago (via Riouw straat) or eastward of Bintan; the western part for vessels coming from, or going to, Malacca strait, or Doerian straat.

(1) Passage westward through the eastern part of Singapore strait.—The eastern entrance to Singapore strait is divided into three channels known as the North, Middle and South channels, of which the Middle channel is recommended for navigation. North channel, lying between Remunia shoals and the mainland to the westward, has no advantage except perhaps to vessels bound northward along the coast; it should be used only by those possessing local knowledge. South channel is not recommended for vessels of deep draught; the bottom is generally rocky and uneven, and the channel is encumbered with shoals. Vessels coming from the Eastern archipelago eastward of Bintan eiland may use South channel, but even these vessels are recommended to stand on, and pass through Middle channel.

(a) Directions.—There is no difficulty in identifying Singapore strait when coming from the eastward, in clear weather; Groote Bintanberg (Bintan Great hill), 1,213 feet (369^{m}8) high, and Gunong Pelali or Barbukit, 624 feet (190^{m}2) high, are both good marks.

(i) *Through Middle channel towards Singapore.*—Sailing vessels will experience no difficulty in working *in either direction* through the eastern part of the strait. The best plan is to keep towards the north shore, in case of having to anchor, as the depths are more convenient on that side. The shore may be approached to depths of 11 or 12 fathoms ($20^{m}1$ or $21^{m}9$); Pulau Mungging, kept open of Tanjong Ayam, bearing 075°, leads southward of Johore shoal and, when standing towards this danger, if these objects cannot be seen, preserve the depths mentioned, for the shoal is steep-to.

When eastward of Tanjong Ayam keep Tanjong Stapa in line with, or open of Tanjong Ayam, bearing 274°, until Pulau Mungging bears less than 360°; and, when standing towards Falloden Hall shoal, do not bring Tanjong Ayam to bear less than 266°, and when standing towards Congalton Skar and the shoals northward of it, keep Tanjong Punggai bearing less than 337°. A vessel may stand towards Remunia shoals until the southern extremity of Pulau Mungging bears 256°.

There are no dangers on the south side of the strait, excepting those fronting the Bintan eiland coast, and the Crocodile shoal, Pas op klip, and Pan rif, or Karang Galang, in the entrance to Riouw straat. But do not stand so far over as to get near these dangers, for no advantage will be gained by doing so, and the depths there are inconveniently great for anchorage. Nongsa eilanden lying just to the westward of the entrance to Riouw straat, is very convenient for taking bearings to avoid the dangers in the approach to that strait, and if kept bearing less than 270° will lead northward of them all.

(ii) *Passage into Singapore road from the eastward.*—Small vessels bound to Singapore road from the eastward will have no difficulty, as they have merely to proceed to a convenient anchorage. Vessels of less than 15 feet ($4^{m}6$) draught may pass within the banks off Tanjong Katong, by keeping in the run of deep water, fairly close to the end of the lines of fishing stakes which extend out from that point. It is the usual custom for sailing vessels belonging to the port, to keep these banks well aboard when proceeding to the anchorage from the eastward, when the wind is off the land and the tidal stream setting to the westward.

Vessels of heavier draught should keep well outside those banks, and with Mount Serapong, the summit of Pulau Blakang Mati, bearing about 242°, which bearing leads to the anchorage; or to avoid getting under a depth of 6 fathoms ($11^{m}0$).

(*b*) *Passage to the westward to Malacca strait and Doerian straat.*—Follow generally the directions in (2) below in reverse.

(2) Passage eastward through the western part of Singapore strait.—Main strait is the principal channel through the western entrance to Singapore strait; it passes southward of Sultan shoal or Terembu Karimon, Raffles lighthouse on Pulau Satumu and St. John islands; and northward of Pulau Nipa, Kent rocks, Pulau Pelampong, Takong besar, Boelan archipelago and Batam eiland.

South of Raffles lighthouse, Phillip channel joins Main strait; this is the most convenient channel for passage north-eastward from Doerian straat; it is about 3 miles wide and free from danger.

(*a*) *Passage through Main strait.*

Temporary anchorages.—Owing to the strong tidal streams in the western part of Singapore strait, sailing vessels are frequently obliged to anchor, for which purpose the north side of the channel is to be preferred. Between Sultan shoal and Raffles lighthouse on that side there is convenient anchorage in depths from 6 to 12 fathoms ($11^{m}0$ to $21^{m}9$), while to the southward the water is deep, and the bottom rocky; the south side of this part of the strait is, therefore, unsuitable for anchorage, especially as violent squalls are of common occurrence. The most convenient anchorage between Raffles lighthouse and St. John islands is on the banks between the Sisters (Pulau Subar Darat and Pulau Subar Laut) and Pulau Sebarok, in depths of 3 to 8 fathoms ($5^{m}5$ to $14^{m}6$).

Abreast of the south end of St. John islands, vessels ought not to anchor if it can be avoided, for the water is deep, and the tidal streams and eddies run with greater strength than in any other part of the strait.

There is fair anchorage between Buffalo rock and Helen Mar reef, as well as about one mile or so to the northward and westward of the latter dangers; also from one mile to 2 miles eastward of Buffalo rock,in 12 to 15 fathoms ($21^{m}9$ to $27^{m}4$), or between it and Soebar islet. Vessels may stand closer inshore and anchor near the edge of the 10-fathoms ($18^{m}3$) contour line, south-westward and north-eastward of Soebar islet ; it is unadvisable to go closer in, on account of the strong tidal streams, sometimes rendering it difficult to get underway again, especially in the light winds which prevail here.

(*i*) *With a fair wind.*—In proceeding eastward through the western part of Singapore strait, from a mid-channel position between Klein Karimoen and Tanjong Piai, where there are depths of about 20 fathoms ($36^{m}6$), no directions are necessary for a vessel with a fair wind beyond keeping in the fairway, other than observing that Raffles lighthouse, bearing 101° leads midway between the shoals of 28 feet ($8^{m}5$) and 34 feet ($10^{m}4$) on either side of the fairway. A sailing vessel should steer between 090° and 112°, as the prevailing tidal stream may require.

Having passes Nipa lighthouse, steer to round Raffles lighthouse from half a mile to one mile distant; or if the wind and tidal stream be adverse, or from other circumstances it be desirable to do so, anchor to the westward of Pulau Senang or Barn island, out of the strength of the stream. Having rounded Raffles lighthouse, steer to pass St. John islands about half a mile distant; keep Raffles lighthouse bearing more than 245°, to avoid the rocks south-eastward of Pulau Sebarok. After passing West St. John island, and bound to Singapore, proceed as directed below; but if bound through the eastern part of the strait, shape course to pass northward of Horsburgh light, and proceed as directed in (1) (a) above in reverse.

(*ii*) *Working through.*—To the eastward between St. John islands and Raffles lighthouse, it is usual to keep on the north side of the channel, making short tacks if necessary, as that part of the strait affords tolerably convenient anchorage along the greater portion of it, and vessels are liable to meet with light baffling airs which would render it necessary to anchor. It is especially requisite to attend to this when eastward of Buffalo rock, for on that part of the south side of the strait the water is deep, and the bottom rocky and unsafe for anchoring, the danger being much increased by rapid tidal streams with eddies and overfalls.

All dangers on the north side of this part of the strait will be avoided if the south extreme of West St. John island or Pulau Sakijang Bendera is kept bearing less than 065°, or Raffles lighthouse more than 245°; this will clear the rocks south-eastward of Pulau Sebarok. Care should be taken to avoid the shoal with a depth of 35 feet ($10^{m}7$), about one mile south-eastward of Pulau Subar Laut or South Sister. Provided Pulau Jong can be seen open westward, or eastward, of Pulau Sebarok, within which limits lies the danger sector for the above mentioned rocks, it is safe stand a little further northward; westward of the rocks to a bearing of 067°, and eastward, to a bearing of 079°, of the south end of West St. John island.

Approaching Buffalo rock from the westward, stand to the southward, if necessary, until Pulau Pelampong bears 266°, which leads northward of Helen Mar reef, but it is better to keep to the northern shore.

(b) Directions from Main strait to Singapore.

(i) With a fair wind.—When bound, in a vessel of deep draught, to Singapore road from the westward, and having rounded Peak island, or Pulau Tembakul, at the distance of about 2½ cables, steer in with Fort Canning lighthouse in line with Telok Ayer fish-market clock tower bearing 345°, in not less than 5¾ fathoms ($10^{m}4$) at low water springs, until the south extreme of Pulau Blakang Mati bears less than 235°; then steer north-eastward for the desired anchorage.

In vessels of light draught, from abreast and eastward of Peak island steer direct for Singapore road by passing over Outer shoal, observing that the depth is 20 feet ($6^{m}1$) only at low water at the south-western end, and from 24 to 36 feet ($7^{m}3$ to $11^{m}0$) over part of the remainder.

(ii) Working through.—In working in the day time towards the dangers between St. John islands and Pulau Blankang Mati, care must be observed not to bring Peak island, or Pulau Tembakul to bear less than 168°, while Mount Serapong, the summit of Pulau Blakang Mati, bears more than 292°, to avoid the patches on the west side of Quarantine anchorage; but when Mount Serapong is less than that bearing, stand on until the western extreme of West St. John island bears 195°.

The shoalest spot on Outer shoal will be avoided by not bringing Peak island to bear more than 184°, after the south extreme of Pulau Blakang Mati bears 282°. The south extreme of Pulau Blakang Mati, if not brought to bear more than 248°, leads northward of Outer shoal; if not wishing to stand over this shoal, when outside or southward of it, do not bring the south extreme of Pulau Blakang Mati to bear less than 260°.

(c) Eastward to the China sea.—Follow generally, in reverse, the directions given in (1) (a) (i) and (ii) above.

Route 1,128. Soenda (Sunda) straat to, and through Gaspar straten

In this route there is first a general description of Gaspar straten; this is followed by directions from Soenda straat to, and through Macclesfield channel, and then from Soenda straat to, and through, Stolze straat. After this there is a note on Clement channel, which is not recommended for sailing vessels; and finally directions for proceeding from Gaspar straten to the northward.

Gaspar straten.—General description.—Gaspar straten lies between the large islands of Banka and Billiton, and is divided into three principal passages, named successively from west to east. Macclesfield channel, Clement channel, and Stolze straat.

Gaspar straten is frequently used by steam vessels and sailing vessels proceeding from Soenda straat to Singapore, or from the western part of Java to the China sea, and vice versa, although the route through Banka straat is safer and better lighted. *See* Route 1,123.

For steam vessels, and sailing vessels with a fair wind, Stolze straat is preferable, being the broadest and having no dangers in the fairway. Sailing vessels working through, and steam vessels of low power, should use Macclesfield channel during the North-West Monsoon (but *see* the remarks at the beginning of (1) (b) below), and Stolze straat during the South-East Monsoon, the currents thus being less unfavourable. Clement channel is seldom used.

The reefs which dry are nearly always discernible, when covered, by the brown or green colour of the water over them. The other reefs are, however, usually difficult to discern, as the water in the strait is somewhat troubled, and they are only recognisable when stream and wind cause tide rips and surf. Large brown patches of fish-spawn, often seen in and near the strait, may be mistaken for the discoloration of reefs.

(1) SOENDA STRAAT TO, AND THROUGH MACCLESFIELD CHANNEL.—Having passed through Soenda straat (*See* Route 1,121) and eastward of Swallow bank and westward of Jason rots *(See* Route 1,122), proceed as follows:—

(a) With a fair wind.—Steer to sight and pass Noordwachter (North Watcher) and then make for a position about 4 miles westward of Hippogriffe riffen; then steer to make good 005°, passing westward of Fairlie rock and Blas Mateu, when land will soon be sighted; Ondiepwater eiland should on no account be sighted by day. When past Blas Mateu steer to pass midway between the bank, with a depth of 2 fathoms ($3^{m}7$), lying about 6½ miles southward of Tanjong Moeroeng, and Sittart riffen, taking care to avoid the 5-fathom ($9^{m}1$) patch about 5½ miles southward of the former, and thence northward between Discovery rocks and Tjelaka, giving the latter a berth of about 2 miles; care must be taken to avoid the 5-fathom ($9^{m}1$) patch lying about 3½ miles eastward of Tanjong Laboe. When the northern extremity of Pulau Liat bears 090° steer to pass eastward of Gaspar island, or eastward of Tanjong Berikat, according to destination.

Note.—In thick weather it is advisable to anchor on the bank, around Hippogriffe riffen, in depths of from 7 to 10 fathoms ($12^{m}8$ to $18^{m}3$), and await more favourable conditions. Vessels coming from the Java sea, and uncertain of their position, can approach the coast of Sumatra to a depth of 9 fathoms ($16^{m}5$).

CAUTION.—Vessels proceeding through Macclesfield channel at night should take care that they sight Tanjong Moeroeng during daylight, if coming from the southward; if approaching from the northward, Tanjong Berikat should be sighted during daylight.

(b) Working through Macclesfield channel from the southward.—During the strength of the North-West Monsoon it is almost impossible to work through Gaspar straten; even in the latter part of the monsoon, about March, when the winds are light, sailing vessels often are obliged to anchor on account of the strength of the southerly current. In the easterly monsoon also, vessels will often meet with light variable winds, rendering it impossible for them to preserve a direct course.

The approach to Macclesfield channel does not afford convenient objects as marks to keep vessels clear of danger, but the following directions are given as being, so far as can be judged, the best for that purpose. As, however, some of the objects are at a considerable distance from the dangers, navigators are cautioned not to depend too implicitly upon being able to recognise such distant objects. Particular attention should be paid to the set of the tidal streams and currents, and to sounding, in order to work through the channel safely.

Coming from Soenda straat a sailing vessel is advised to work up the coast of Sumatra. *See* Route 1,122. Approaching Macclesfield channel proceed as follows.—

(i) Standing to the eastward.—Being northward of Hippogriffe riffen stand to the eastward towards Zand (Sand) rif, which does not quite cover at high water, until it is but 4 miles distant, or within half a mile of Haaien (Haaijen) rif, giving Blas Mateu and Fairlie rock a wide berth. Ondiepwater eiland (Shoalwater island), bearing 028°, leads one mile westward of Branding riffen. This island should not be approached nearer than 3 miles, on account of the dangers lying westward of it.

Clearing marks for Sittart riffen.—Tanjong Moeroeng (Murung) kept bearing more than 318° leads south-westward of Sittart riffen (Vansittart shoals), and Kalangbahoe (Kalangbue) summit, bearing 054°, leads north-westward of their southern and central portions; Keladi (Putat), 488 feet (148^{m}7) high, on Pulau Liat, kept bearing more than 005°, leads westward of the western shoal, which is awash at low water, and the north end of Aoer (Auer) eiland, open northward of Bakau eiland, bearing 064°, leads northward of the riffen.

Being northward of Sittart riffen, do not bring Bakau eiland to bear more than 108°, nor Selemar (Slemar) eiland less than 360°, to avoid the shoals between those islands; and to clear the reef extending 3 miles southward of Pulau Liat, keep Pulau Koeël (Kwil) bearing less than 108° if Keladi (Putat) hill on Pulau Liat bears less than 349°.

To clear the reefs and shoals lying south-west and west of Pulau Liat, Bakau eiland must not be brought to bear more than 134° until Tjelaka (Chelaka) bears 090°; and to clear Discovery rocks, keep Tanjong Laboe (Labu) bearing more than 220° until Tjelaka bears 090°, which bearing also clears the rocks to the northward.

To clear the reefs extending off the north-west side of Pulau Liat, keep Tanjong Laboe bearing less than 215° until the south extreme of Kelapan (Kilapan) bears 247°.

(ii) Standing to the westward.—To clear the banks between Blas Mateu and Tanjong Moeroeng (Murung) keep Laboe (Rocky point hill), about 2 miles westward of Tanjong Laboe, open eastward of Tanjong Moeroeng, bearing 344° until Baginda, a hill 550 feet (167^{m}6) high, about one mile north-westward of Tanjong Baginda (Besar on some charts), bears 276°; after which it is possible to stand westward until Tanjong Moeroeng bears 017°.

To clear the shoals off the east side of Pulau Lepar, Tanjong Moeroeng must not be brought to bear less than 219° until the north-east extreme of Kelapan bears 308°.

The directions for clearing Discovery rocks have been given in the penultimate paragraph of " Standing to the eastward " above.

To avoid Wilson bank, Laboe (Rocky point hill) must not be brought to bear less than 186°, or Tanjong Laboe less than 180°, until Tanjong Berikat bears less than 322°.

(2) SOENDA STRAAT TO, AND THROUGH STOLZE STRAAT.—For sailing vessels with a fair wind, Stolze straat is preferable to the others, and should present no difficulties; the land is, in fine weather (the westerly monsoon period), visible from the outer dangers. The greater breadth of Stolze straat enables sailing vessels to make longer boards, and as most of the islands can be seen at night the vessel's position is more easily fixed.

The shoals that lie within it appear to form the only drawback to the adoption of this channel, and in clear weather (the westerly monsoon period), even this drawback would almost disappear, for good hill peaks, by which to fix the ship's position, are visible on all sides, distant from 20 to 35 miles.

(a) Passage with a fair wind.—With a fair wind, making for Stolze straat from southward, from Noordwachter (North Watcher) shape course for Larabe rif during the North-West Monsoon, and for Carnbee rocks in the South-East Monsoon. In clear weather the mountains in the south-western part of Billiton eiland will be sighted some distance southward of these dangers; Loedai, which may be visible from about 12 miles southward of the Carnbee rocks, first comes into sight, and shortly afterwards Beloeroe (*Lat. 3° 10′ S., Long. 107° 41′ E.*) will be sighted. When near Larabe rif other mountains on Billiton eiland, as well as Ondiepwater eiland, should be sighted, so that in clear weather there is no difficult in making the strait.

If a vessel is far to the eastward of the track, Kebatoe (Kebatu) eiland, 341 feet (103^{m}9) high, about 25 miles south-eastward of Carnbee rocks, will be a useful mark for fixing the position of the vessel.

When the vessel's position has been determined steer a northerly course, passing about 6 miles eastward of Ondiepwater eiland, midway between Kasenga and Geresik (Gresik) eilanden and not less than 2 miles westward of Tanjong Ajer Lantjoer.

With bad visibility or in thick weather, sounding must be depended upon entirely; in such cases it is advisable to make the southern edge of the bank, with depths of from 7 to 10 fathoms (12^{m}8 to 18^{m}3), clay with sand, which extends about 28 miles southward from Ondiepwater eiland, by sounding, and then immediately steer eastward until in depths of more than 10 fathoms (18^{m}3); then steer northward, taking care to keep in depths of more than 10 fathoms (18^{m}3), and when passing eastward of Ondiepwater eiland, keeping in depths of not less than 16 fathoms (29^{m}3). If, however, depths of over 20 fathoms (36^{m}6) have been obtained when making for the southern entrance, it may be presumed that the vessel is well over on the eastern side of the channel, and a north-westerly course may then be steered, taking care to keep in these depths. In unfavourable conditions, or if any doubt as to which side of the strait the vessel may be, it is advisable to anchor; bad visibility does not usually last for any length of time.

At night, Stolze straat can be approached from southward without danger in clear weather, as the light on Ondiepwater eiland is visible up to 3 miles southward of Hancock shoal, the southernmost danger on the western side of the approach. When this light is sighted steer to pass about 2 miles eastward of Ondiepwater eiland, and thence proceed northward until in the arc of visibility of Tanjong Ajer Lantjoer light, which must be kept between the bearings of 003° and 022°. When Geresik eiland is sighted, the position can be fixed by bearings of this island and Tanjong Ajer Lantjoer light, and course may be shaped to pass either eastward or westward of Akbar droogte, according to destination; vessels passing eastward of this shoal have the advantage of being able to fix their position by bearings of Langkoeas light in addition to Tanjong Ajer Lantjoer light; passing westward vessels make for Gaspar island.

(b) Working through Stolze straat.

(i) Standing to the eastward.—Standing towards Carnbee rock, keep Beloeroe (Beluru), a mountain 1,129 feet (344^{m}1) high, about 6½ miles north-eastward of Tanjong Genting, bearing more than 011°; and to clear Naga rif, Aanvang bank and Cooper shoal, keep Marang Bolo, a hillock on the southern point of Selioe (Selio) eiland bearing not less than 350°. To avoid the dangers northward of Cooper shoal keep further westward, Marang Bolo bearing more than 010°.

Pass Witte klip (White rock) at a distance of at least one mile, the approach from the southward being on a bearing of more than 001°, but to the northward it should not bear more than 112°, until the north point of Selioe eiland bears 073°, to clear Karang Tiga; after passing which, Witte klip must not bear more than 146°, or Marang Bolo more than 124°, until Koerier (Kurier) droogte and the 6 fathom (11^{m}0) north-westward of it are cleared.

After passing these dangers, Marang Bolo bearing less than 132° will lead south and south-westward, and Tanjong Ajer Lantjoer bearing more than 003° westward, of all dangers until northward of Lima eilanden. After Geresik (Gresik) eiland bears 270° stand a little further to the eastward, but keeping Tanjong Ajer Lantjoer bearing more than 355° until within about 2 miles.

Give the lighthouse on Tanjong Ajer Lantjoer a berth of about 1½ miles, and keep it bearing less than 158° until Langir eiland bears 046° to clear the reef round Hoog eiland; northward, Hoog eiland in line with the lighthouse bearing about 180° leads fully one mile westward of Malang Wankang and will clear all the reefs between Hoog eiland and Langir eiland.

Give the coast between Mendanau eiland and Langkoeas (Langkuas) eiland a berth of 6 to 7 miles keeping Langir eiland bearing less than 214° and Langkoeas bearing more than 046°.

(ii) Standing to the westward.— Ondiepwater (or Si Medang) eiland, shown as Shoalwater island on some charts, if not brought to bear more than 000°, will lead eastward of all the shoals southward of it, and sounding will also give good warning when standing towards them, as they lie some 4 or 5 miles within the edge of the 10-fathom (18^{m}3) line. Ondiepwater and Kleine Ondiepwater (Hancock) eiland must be approached with caution, as sounding does not give much warning when nearing their outlying reefs; they should on no account be approached within a distance of 2½ miles. Kleine Ondiepwater (Hancock) eiland bearing 183° leads eastward of Bliss shoals, between which and Aoer eiland a vessel may stand to the westward until the summit of that island bears 023°, which will lead eastward of Sittart riffen. Kalangbahoe islet bearing 265° leads southward of the dangers extending from Aoer eiland and Geresik eiland. The east side of Geresik eiland may be approached to a distance of one mile; but the east side of Kelemar (Klemar) eiland has a rock lying one mile off, which will be avoided if Geresik eiland is not brought to bear less than 160°. The summit of Aoer eiland, in line with the east extreme of Kelemar, bearing 180°, leads 1½ miles eastward of General Hewitt reef (Hewitt shoal).

Having passed General Hewitt reef, stand further westward towards Pulau Liat, but the south-eastern extreme of that island must not bear less than 200° to clear the reefs off its north-eastern side. When northward of all the reefs off the north side of Pulau Liat (At night the light on Tanjong Ajer Lantjoer or, by day, the rounded summit of Sagoweel, about 2 miles south-eastward, bearing more than 111°) stand westward towards Banka eiland. The directions given in (1) (b) (ii) " Standing to the westward " should be followed.

(3) CLEMENT CHANNEL.—This channel eastward of Pulau Liat, is narrower and more encumbered with dangers than either Macclesfield channel or Stolze straat, between which it lies, but is easily navigable by sailing vessels with a fair wind, during daylight. No vessel would from choice attempt to work through Clement channel, as Macclesfield channel and Stolze straat are much better adapted for that purpose; but it is possible that a vessel, embarrassed by light baffling winds, may find it convenient to proceed through some part of it. The numerous islets afford every facility for fixing the position of the vessel from time to time.

Route 1,129. Gaspar straten to Riouw (Rhio) straat

Most vessels, bound to the northward from Gaspar straten, prefer passing eastward of Gaspar island, which is the safer route; but some, especially when bound to Singapore by Riouw straat, prefer the less safe, but more direct, route between the shoals westward of that island, or as an alternative to pass between Tanjong Berikat and Boompjes eiland. During the strength of the westerly monsoon northerly winds will be met along the coast of Banka eiland and the adverse current off and westward of Tanjong Berikat will make it difficult to beat up.

(a) Passage eastward of Gaspar island.—With a fair wind pass about 3 miles eastward of Gaspar island between Canning rock and that island. Continue northward keeping Gaspar island bearing more than 180° to clear Belvedere rock, Magdalen reef and Lanrick reef. As Gaspar island summit is said to be visible from a distance of 32 miles in clear weather, a vessel should be nearly abreast of Lanrick reef before losing it.

After clearing Lanrick reef pass eastward of Severn reef and between that reef and the group of reefs about 27 miles to the north-north-eastward. Soundings give no warning of the approach to any of the above, as they are steep-to, but in the vicinity of Severn reef, in fine weather, the highest hill on Tanjong Toeing and Radja heuvel on Tanjong Radja are visible.

If the wind should prevent a direct course from being steered from abreast Pulau Liat in Gaspar straten, Gaspar island should not be brought to bear less than 338° until the vessel is northward of Akbar droogte. After passing about 3 miles eastward of Gaspar island proceed as above.

Having passed Severn reef steer eastward of Toty (*Lat. 0° 55′ S., Long. 105° 46′ E.*) and continue north-westward to join Route 1,124 (a), " Banka straat to Riouw straat," north-eastward of Tanjong Djang.

(b) Passage westward of Gaspar island.—Proceed northward as in (a) above to clear Akbar droogte, but noting that the direct course required passes about one mile westward of Gelassa (Glassa) rots. After passing Gelassa rots steer 000° until the summit of Gaspar island bears 135°, which bearing if retained, leads about 4½ miles north-eastward of Vansittart (Sittard) reefs, passing between Warren Hastings reefs and Tioeng (Tijong) rif; Gaspar island bearing 135° will also assist in passing eastward of Keuchenius rif, although it will be lost to sight a few miles before reaching the reef.

There should be no difficulty in avoiding Iwan and Severn reefs as the Banka island coast can generally be seen from the former, and mountains from the latter as described in (a) above, the directions in which can be followed from this point.

If circumstances prevent a straight course from being steered when northward of Gaspar island, keep its summit bearing between 130° and 146° until Tanjong Berikat bears 195° to clear Warren Hastings and Tioeng reefs; thence keep the summit between the bearings of 135° and 157° to pass between Vansittart and Keuchenius reefs to the westward and Magdalen and Lanrick reefs to the eastward. Thence as before.

(c) Passage between Tanjong Berikat and Boompjes eiland.—Having passed about one mile off either and proceeding to the north-north-westward, keep Boompjes eiland bearing less than 146° to clear the south-west extreme of Warren Hastings reefs; thence keep Tanjong Berikat bearing between 175° and 195° to lead westward of Warren Hastings reefs and Tioeng rif, and eastward of Vansittart reefs. After Gaspar island bears more than 135° proceed as in the last paragraph of (b) above.

Route 1,130. Banka straat or Gaspar straten to Singapore strait, passing eastward of Bintan island

This route is an alternative route to Singapore to those described in Routes 1,124 to 1,129 above. The route is not recommended in the period November to March, the season of northerly and north-westerly winds.

(1) From BANKA STRAAT.—Having passed eastward of Saja as described in Route 1,124, a vessel should steer a northerly course so as to pass eastward of Admiral Stellingwerf rif, crossing the equator in depths of about 20 fathoms (36^{m}6). At night it is advisable to keep in depths of not less than 23 or 24 fathoms (42^{m}1 or 43^{m}9) when between lat. 0° 30′ N. and lat. 0° 50′ N. Merapas bearing 315° or less leads north-eastward of Admiral Stellingwerf rif and

Geldria. Having rounded the north-east point of Bintan at a safe distance proceed as in Route 1,127 (1), preferably using the Middle channel.

(2) From GASPAR STRATEN.—First proceed as in Route 1,129 (a) as far as Lanrick reef, and then continue on a course 000° until Pejantan is sighted. Thence shape course for Singapore strait. *See* Route 1,127 (1).

Route 1,131. Banka Straat or Gaspar straten to the China sea. *(May to September).*

In either case the route northward into the China sea in these months is as direct as possible. From Banka straat (*See* Route 1,124), after clearing Saja islet steer to pass between the Anamba and Natuna islands; but *see* Route 1,309, from Eastern archipelago and 1,301, 1,302, etc. from Singapore.

From Gaspar straten either proceed northward as in Route 1,130 (2) above to sight Pejantan, and thence eastward of Tambelan islands, and between those islands and the coast of Borneo; or steer directly to pass westward of the Pengibu islands. In either case continue northward between the Anamba and Natuna islands. *See* also Routes as above.

Note.—When the North-East Monsoon is likely to commence before reaching Hong Kong, pass through the Api and Palawan passages. (*See* Routes 1,302 and 1,303).

Route 1,132. Soenda (Sunda) straat to Karimata straat and the China sea

Karimata (Carimata) straat is the passage between Billiton eiland and the Momparang (Montaran) eilanden on the western side, and Karimata eiland and the Borneo coast on the eastern side; it is the customary route taken by vessels bound for the Straits Settlements or China from the eastern part of the Java sea. Such vessels pass well outside all the dangers lying off the eastern side of Billiton eiland, and practically never sight either Billiton eiland or the Borneo coast; the direct route to Pontianak from the Java sea is eastward of Karimata eiland.

The main route lies eastward of Discovery East bank (*Lat. 3° 35′ S., Long. 109° 11′ E.*) and Cirencester shoal; it is possible that uncharted dangers may exist westward of the line joining these two dangers. The lines joining Discovery East bank, Catharine reef, and Ontario reef must be considered as the western limit of safe navigation for large vessels passing through Karimata straat.

Besides the main channel, there are several other channels between the numerous islands lying eastward and north-eastward of Karimata eiland, and between it and the Borneo coast. The eastern of these, known as Greig and Inner channels respectively *(see below)* have a regular tide, and convenient depths for anchoring, and are therefore much frequented by vessels working through the strait; it being quite impossible to work through the main channel against a strong monsoon, and a continuous current setting to leeward.

Tidal streams and drift streams.—The horizontal movement of the water in Karimata straat is mostly a drift stream. The tidal streams are diurnal, but their influence is only felt under the coasts of Billiton eiland and Borneo; they are, therefore, of little importance to large vessels passing through the strait.

In the open part of the strait the mean rate of the drift stream is half a knot in the South-East Monsoon, and nearly one knot in the North-West Monsoon; it is, however, subject to considerable variations, which cannot be predicted, so that a maximum rate of nearly 2 knots has been observed in the South-East Monsoon, whilst no more than 1½ knots was observed in the North-West Monsoon. As the direction of the drift stream depends on the direction of the predominating wind, it practically follows the direction of the channel.

(1) SOENDA STRAAT TO KARIMATA STRAAT.—Pass through Soenda straat *(See* Route 1,121), and thence eastward of Swallow bank and westward of Jason rots *(See* Route 1,122). Thence having sighted and passed Noordwachter (North Watcher), shape a course to pass southward of Discovery East bank light-structure or light, noting that the latter is obscured when bearing between 052° and 135°.

Note.—Kebatoe eiland (*Lat. 3° 48′ S., Long. 108° 04′ E.*), 341 feet (103^{m}9) high, makes a good mark when approaching Karimata straat from the south-westward. It is visible as a conical hummock from a distance of 22 to 24 miles in clear weather.

(2) PASSAGE THROUGH KARIMATA STRAAT TO THE CHINA SEA.

(a) Direct with a fair wind.—Having passed eastward of Discovery East bank, steer northward approximately on its meridian until past the Momparang eilanden; then alter course north-westward so as to pass between Ontario reef and Seroetoe eiland, steering so as to pass Seroetoe lighthouse at a distance of about 5 miles. Proceeding northward to the China sea, after passing between Ontario reef and Seroetoe eiland, keep approximately on the meridian of 108° E., taking care to avoid the reef, with a depth of 2¾ fathoms (5^{m}0), lying about 28 miles north-westward of North Greig reef, and then pass eastward of Pengiki besar. A vessel may pass through Greig channel as an alternative to the main strait. *See* (b) below.

Notes.—Tjabang (Chabang), 3,375 feet (1,028^{m}7) high, the summit of Karimata eiland bearing less than 140°, or the summit of Seroetoe eiland bearing less than 152° leads westward of Gwalia reef and the reefs northward of it. Tjabang is frequently enveloped by clouds; Seroetoe eiland summit can sometimes be seen from a distance of 32 miles.

If making for Karimata straat from East Java make for the eastern side of the southern entrance to the strait, passing westward of Fox banks, Aruba bank and Clemencia bank, and then steer north-westward so as to pass between Ontario reef and Seroetoe eiland.

(b) Working through Inner and Greig channels.

(i) General remarks.—Vessels working through Karimata straat have to take either the Inner channel, suitable for small vessels only, or Greig channel, eastward of Karimata eilanden, the main strait being impracticable on account of the strong adverse current. In these channels the sea is smoother and the current not so strong, it being wholly or in part overcome by the tidal stream and the indraught into the rivers on the west coast of Borneo; vessels also have the advantage of the change of wind at night and in the morning caused by the land breeze, and which often brings it several points more to the eastward in both monsoons.

These channels have a convenient depth for anchoring, with a bottom of soft mud, but working through them is slow and tedious. Sounding gives good warning when approaching the Borneo side; vessels can pass fairly close to the Karimata eilanden.

CAUTION. Considerably less depths than the chart shows have been reported eastward of Boeroeng eiland and between Korok and Aoer eilanden; vessels without local knowledge must exercise the utmost caution when using the Inner route.

(ii) Working through.—Coming from the southward note the western limit of safe navigation described in the general remarks on Karimata straat at the beginning of this route.

When northward of the dangers off Mankoet (Mangkut) eiland and of Tanjong Pagar Antimoen, the Borneo coast may be approached to a depth of 8 fathoms (14^{m}6) and to 6 fathoms (11^{m}0) in Bocht van Soekadana (Sukadana bay). The Vogelnest eilanden should not be approached nearer than one mile. Pass on either side of the Lajah (Layah) eilanden, observing that the water quickly shoals to 5 fathoms (9^{m}1) at 3 miles north-eastward of Meledang eiland, the easternmost, and at less than 2 miles northward of Bulat eiland, the north-easternmost, of the group.

Between Krawang islet and the Lajah eilanden the depths are from 12 to 15 fathoms (21^{m}9 to 27^{m}4), decreasing fairly regularly towards the Borneo coast. Greig channel is deep and bold towards either side.

(3) From KARIMATA STRAAT NORTHWARDS.—Between Penebangan and Masa Tiga eilanden the Borneo coast may be approached to 6 fathoms (11^{m}0), but when about 8 miles north-westward of the Masa Tiga eilanden do not bring them to bear more than 135° (14^{m}6), or stand into depths of less than 8 fathoms (14^{m}6), until off the Padang Tikar, northward of which the coast may be approached to within 4 miles. The western islet of Masa Tiga eilanden is usually visible at a distance of about 20 miles.

A vessel may stand off to, or westward of, the Leman eilanden, observing that those islands (in sight from aloft) kept bearing more than 140° lead eastward of Twilight reef and of the reefs westward of it.

Having cleared dangers as above, make good a course towards Pulau Datu or Pengiki besar and thence to destination. *See* Route 1,309 from Eastern Archipelago and Routes 1,301, 1,302, 1,303, etc. from Singapore.

Route 1,133. Soenda (Sunda) straat eastward through the Java sea and Flores sea to the Banda sea, joining the "Second Eastern passage." *See* "A" (ii) below on this page.

Vessels which have passed through Soenda straat into the Java sea, and find that the North-West Monsoon in those waters, and the North-East Monsoon to the northward in the China sea have already begun, are advised to make to the eastward at once, and to pick up the "Second Eastern passage" *See* sub-section "A" (ii) on this page, in the Ceram sea northward of the Moluccas. This route is available from November to February.

Alternatively, a vessel can join the "First Eastern passage" off the entrance to Macassar strait, but there is no advantage in so doing. *See* "A" (iii), on page 266. The route can be taken in November, but it is more suitable for south-bound traffic.

To join the "Second Eastern Passage the route may be made eastward along the northern shore of Java, via Sapoedi straat (Sapudi strait) (*see* Route 1,157), Bali, Lombok and Soembawa islands, past Flores island into and through the Flores sea and Banda sea to the Ceram sea; but the better recommended, and more usual route is to stand north-eastward from Soenda straat, and pass through Saleier straat (southward of the south extreme of Celebes) and Buton passage (southward of the south-east extreme of Celebes) into the Banda sea, and onward.

The description of, and directions for Ceram sea, Manipa straat, Djailolo passage and Dampier straat are given in Routes 1,136 and 1,137.

The description of Saleier (Salayar) straat and Buton passage follows.

Saleier straat (Salayar) straat is about 9 miles wide between Tanjong Lassa and the island of Saleier; it is the usual route taken by vessels proceeding from Macassar strait to the east coast of Celebes, and by those proceeding from the Java sea to the Moluccas; the deep, middle part of the strait, 3 to 3½ miles wide, between the islands Sarontang and Pasi Tanete, is generally used.

Three dangers lie in the western approaches, viz., Taka Rangkap, with a depth of 2½ fathoms (4^{m}6) over it, lying about 12 miles westward of Sarontang; Taka Boloh, with a least depth of 4 fathoms (7^{m}3), about 16½ miles west-south-westward of Sarontang; and Quirk reef, reported in 1943, about 6 miles west-north-westward of Taka Boloh.

Buton passage, so named on British Admiralty charts, is the deep, wide, and clear channel along the south and south-east coasts of Boeton eiland; it is bounded southward by Batoe Ata (Hagedis eiland), and south-eastward by Toekang Besi eilanden. The passage is easy to navigate by day or by night in all circumstances.

With westerly winds, when coming from Saleier straat close Tanjong Batoe Toero, the south-east point of Boeton eiland to about 3 miles, and keep along the coast as far as Tanjong Kassolanatoembi to prevent being set over towards the Toekang Besi eilanden and reefs, in the light airs and southerly currents which frequently prevail in the offing.

Routes 1,134 and 1,135.—*Reserved as spare.*

A. (ii) ROUTES NORTHWARD FROM OMBAI STRAAT

"The Second Eastern passage."

The passage from the South Indian ocean to the China sea through Ombai straat is usually made during the season October to March. When proceeding to Singapore, the routes via Soenda straat should be taken. *See* sub-section "A," (i) of this chapter.

An alternative route in October and November is to pass through one of the central passages, Bali straat, Lombok straat or Alas straat, joining the route from Ombai straat in the Ceram sea. *See* sub-section "A" (iii) of this chapter.

CAUTION. December to April is the season of the Tropical storms known as Willy willies. They may occur occasionally in November. *See* Section B., Part III., Chapter I., page 86.

From Ombai straat, the route is either westward of Boeroe (Buru) eiland or more usually, through Manipa straat between Boeroe and Manipa eilanden, into the Ceram sea. Thence pass through Djailolo passage or Dampier straat into the open Pacific ocean. When in the Pacific ocean, make casting between the parallels of 1° 30′ N. and 3° 00′ N. until able to pass eastward of the Palau islands; but between March and September pass westward of these islands.

Having passed the Palau islands a choice of routes is available as follows.—

(a) Make to the north-westward to pass through Surigao strait into the Sulu sea, and thence via Mindoro strait, or Verde Island passage, into the China sea, and so to Manila or Hong Kong.

(b) Pass through San Bernardino strait and Verde Island passage; thence as in (a).

(c) Perhaps the more usual route after passing the Palau islands is to stand north-west outside the Philippine islands and thence.

(i) If bound to Hong Kong, pass through the Balintang or Bashi, channels.

(ii) If bound to Shanghai pass between Sakishima guntō and Okinawa guntō, and so to the Yangtze kiang estuary.

(iii) If bound to Japan keep more northerly than the Shanghai route, and in the full strength of the Kuro shio current.

A description of the straits and passages lying in the "Second Eastern passage" follows. For the sake of convenience the passage is divided into three routes; firstly from Ombai straat to the Ceram sea; secondly, from the Ceram sea through Djailolo (Jailolo) passage or Dampier straat; and thirdly from either of the latter two channels northward to the China sea.

Route 1,136. Passage through Ombai straat to the Ceram sea.

General description of Ombai straat.—Ombai straat is the broad deep passage separating the north-west coast of Timor from the Alor islands; from October to March it is frequently used by sailing vessels proceeding from Europe to China and Japan, and is also used by sailing vessels bound for East Java from the China sea from the middle of May to the end of June.

Tidal streams.—The tidal streams are noticeable in Ombai straat; during the South-East Monsoon, however, there is generally a stream running in a west to south-west direction, and in the westerly monsoon a stream running in an east to north-east direction. The maximum observed rate was 3 knots; it occurred in June, with a stream running in a south-west direction.

Winds and weather.—In the partially enclosed region northward of Sawoe (Savu) eilanden and Timor, known as the Savu sea, especially in the eastern portion, where it is continued eastward by Ombai straat, the percentage of bright sky is greater than in any other part of the archipelago, and the haziness is equally great whenever easterly winds blow; the rainfall is heaviest in December and January, but showers may fall with all westerly winds.

The South-East Monsoon blows steadily between the middle of April and the end of September, from east-south-east to south-east, the land breezes from Timor increasing at night, and the sea breezes diminishing by day the force of the wind; similarly in the other season the wind will be most steady by day and unreliable at night.

In October and November the winds are from south-east to south-south-west, and in December from the south-west quarter, accompanied by thunderstorms, but the westerly monsoon does not reach its full development, from west to west-north-west, until January, and begins to abate in February. Variable winds will then blow until April.

(1) PASSAGE THROUGH OMBAI STRAAT.—Proceeding north-eastward through Ombai straat make the east point of Soemba (Sumba) eiland (*Lat. 10° 8′ S., Long. 120° 51′ E.*), and pass between it and Sawoe (Savu) eiland or between Sawoe eiland and Roti eiland, if falling to leeward with north-westerly wind. Under the exceptional conditions of a strong north-west wind and lee current, it may be desirable to pass westward of Soemba eiland and south of Flores.

(2) OMBAI STRAAT TO THE CERAM SEA.—Passage should be made to pass westward or eastward of Boeroe (Buru) eiland.

(*a*) *Westward of Boeroe eiland.*—Steer across the Flores sea and the north-west portion of the Banda sea to weather the west coast of Boeroe eiland. If falling to leeward, instead of working up to weather Boeroe eiland, it is better to pass southward of the island and through Manipa straat.

(*b*) *Eastward of Boeroe eiland.*—This is the usual route. Steer directly for Manipa straat and pass through it to the Ceram sea.

Notes.—Manipa straat, which separates Boeroe and Manipa eilanden, is a good and safe channel; it is adjacent to Ambon (Amboina) which thus forms a convenient port of call, at which water, provisions and a small quantity of fuel oil can be obtained.

During the North-West Monsoon vessels making northward should do so along the east coast of Boeroe eiland where the adverse tidal stream is not so strong, and the favourable tidal stream runs strongly. In the strength of the monsoons, there may be a high sea running in Manipa straat; if so, consideration must be given to the use of Kelong straat between Manipa and Kelong eilanden, but an adverse current prevails here during the North-West Monsoon season.

Route 1,137. Through Ceram sea to, and through Djailolo passage or Dampier straat, or through the Molucca sea to the Pacific ocean

The Ceram (Serang) sea is the wide channel extending from the eastern side of Celebes on the west, as far as the meridian of Misool eiland on the east. It is bounded on the north by the islands of Soela and Obi and the chain of islands extending eastward to Kofiau, and on the south by the islands of Boeroe and Ceram.

Having entered the Ceram sea as in Route 1,136, steer as directly as possible to pass through one of the channels between the chain of islands between Obi Major and Kofiau into the Halmahera sea. The channel between Tobalai and Kekek eilanden is recommended in the North-West Monsoon so as to keep well to windward.

Continue northward through the Halmahera sea and pass into the Pacific ocean through Djailolo passage or Dampier straat. Sagewin straat between Batanta and Salawati eilanden should not be taken by sailing vessels, as there are frequent calms on account of the high land on either side, and the rapid tidal streams with strong eddies are liable to make the vessel unmanageable; it is a deep and safe channel for steam vessels.

Djailolo passage is the deep channel between Moeor (Muor) and Gébé eilanden, the only difficulty in passing through which is the strong tidal streams often accompanied by whirlpools and tide rips off Tanjong Sofa, the north-western extremity of Gébé eiland.

Dampier straat lies between the southern side of Waigeo and Batanta eilanden. The main channel is between Mansoear, Kri and Koh eilanden situated about 3 miles southward of Gam eiland, on the north, and Augusta and Duiven eilanden, on the south. There is a safe channel southward of Duiven eilanden and another along the northern side of Batanta eilanden.

Tidal streams.—In the western approach to Dampier straat between Kofiau eiland and the western end of Batanta eiland, there is frequently a south-going stream from September to April, but the streams are greatly affected by the direction and force of the wind. From May to August the stream here sets north-west and north, whilst there is little or no stream during the transition months.

In the height of the North-West Monsoon, in the narrow part of the strait, between Duiven and Djerief eilanden the stream at springs sets east-north-eastward for 6 or 8 hours, at the rate of 4 to 5 knots, and from one to 3 knots at neaps during the falling tide, and sets south-westward for 3 or 4 hours, during the rising tide, but is weak. During the height of the South-East Monsoon, from May to September, in this part, the stream sets westward for 8 or 10 hours, during the rising tide, turning gradually to south-west by south; it then attains its greatest rate, which at springs, sometimes exceeds 5 knots, and at neaps, 4 knots. The stream during the falling tide at this season, sets east-north-east or north-east, and is neither strong nor of long duration; however, a rate of 4 knots, during one or 2 hours, has been observed.

The stream during the falling tide is usually strongest at the eastern entrance to the strait in both monsoons, and during the South-East Monsoon an easterly stream sometimes runs for two or three days together

Directions for Dampier straat.—The general directions for the passage of a sailing vessel are the same as those for a steam vessel, which are given in detail in the Eastern Archipelago Pilot, Vol. III.

Note.—If the wind is from the northward, a sailing vessel, having passed through the narrows, should keep over towards Waigeo eilanden rather than New Guinea, to avoid being driven on to the New Guinea coast by the swell from the north. Great attention must be paid to the set of the currents.

Molucca sea.—This sea which separates the north-eastern end of the Celebes from the western side of Halmahera eilanden is bounded on the south by the Soela eilanden. Although it is the principal passage for steam vessels proceeding between the Celebes, Ceram, Banda and Arafura seas, it is not recommended for a sailing vessel working through to the northward during the North-West Monsoon season, the period dealt with in this sub-section, as the current sets with the wind at a rate of 16 to 24 miles a day. If obliged to pass through it, a sailing vessel would find it best to enter through Peleng straat, keeping along the Celebes coast.

During the South-East Monsoon season, the stream in the open sea sets north-north-east at a normal rate of about half a knot, but may attain a rate of as much as 2 knots.

Route 1,138. Djailolo passage, Dampier straat or Molucca sea northward to the China sea

The general directions for the passage northward have been given already at the beginning of this sub-section on page 263; more detailed descriptions and directions are given below for the passage of some of the channels mentioned.

(1) SURIGAO STRAIT (*See* Caution at the end of Route 1,142).—This strait, the only passage for large vessels from the Pacific to the interior waters of the Philippine archipelago, with the exception of San Bernardino strait (*see* (2) below), is famous for having been traversed by Magellan when he crossed the Pacific ocean and discovered the Philippine islands in 1521. The strait is now less frequented by sailing vessels than that of San Bernardino, which is more to windward in the North-East Monsoon. It is, however, more direct and safer than that strait, but it obliges sailing vessels that take it, if they are making for Manila, to work up the west coast of Negros and Panay islands and the east coast of Mindoro island. It is of advantage to vessels going to the southern Philippines or to the Sulu sea.

The main strait is safe and deep throughout its length, and the shores of the islands that border it are steep-to. The entrances to the strait from the Pacific is between Homonhon island to the north and Dinagat island to the south; the western side of the strait is formed by the islands of Leyte and Panaon, and the eastern side by the islands lying northward of the north-east part of the Mindanao island.

Winds. At the mouth of the strait the North-East Monsoon commences towards the end of September, and blows throughout October and November; in December north-east winds alternate with northerly gales. In January, winds blow from north-east to east-north-east accompanied by heavy rain. In February and March, easterly winds prevail. In April, May and June, the prevailing wind is south-east, with occasional gales called *collas* from the south. In July, August and September, *collas* from south-west are frequent.

The north-east winds, though strong, cease during the night; but winds from the south-east, south and south-west continue to blow. It generally rains with north-north-east and east-north-east winds; the rain ceases and the weather clears with east winds, and more so with south-east winds. With south-west winds it remains clear unless a gale arises, which sometimes brings rain.

In general there is no very bad weather in this part of the archipelago, except when a typhoon occurs. The season of the year when a typhoon might occur is from the end of October to the beginning of January. They begin to blow from the north-west and finish from the south-east, having passed through either north-east or south-west; when they shift through north-east they blow the stronger, and more rain falls.

Currents. After passing through Surigao strait into the Mindanao sea, there will be found a constant current to the westward in both monsoons, varying in strength according to wind and tide. Vessels approaching Surigao strait from the westward should keep well over towards Panaon island to avoid being swept by the current towards Camiguin (Kamigin) island (*Lat. 9° 16′ N., Long. 124° 43′ E.*). In the southern part of the sea, on the north coast of Mindanao island there appears to be hardly any tidal stream, and the currents follow the direction of the wind in both monsoons. There appears to be a constant current to the southward between Cebu (Sebu) and Bohol islands, and between Negros and Sikihor islands.

Sailing vessels should work up on the north coast of Mindanao island and make Bohol island eastward of Sikihor island.

The current produced by the tidal wave that enters by Surigao strait and passes between the islands of Panglao and Sikihor divides into two branches. The northern flows north-westward, and striking the south-eastern coast of Cebu island in the vicinity of Dalaguete point, spreads northward and southward along that coast. The north-going stream passes through Bohol strait, and at 5 or 6 miles southward of the Camotes islands meets the south-going stream which has passed between the northern part of Cebu and Leyte islands. The other branch flows westward, and, striking the coast of Negros island at Dumaguete, divides into two other arms, one of which enters Tañon strait at a considerable rate, while the other flows southward between the coast of Negros and Sikihor islands until, off Bonbonon point, it meets the east-going stream around the southern end of Negros island, and the united waters take a south-easterly direction towards Tagolo and Silla points in Mindanao island.

(2) SAN BERNARDINO STRAIT.—San Bernardino strait, which separates the south-east extreme of Luzon from the north-west part of Samar, is so named from the small islets which lie in its eastern entrance. The strait is deep and free from dangers except a few near the shores. The channels eastward and westward of the San Bernardino islets are 5 and 7½ miles wide respectively, with depths of 30 to 70 fathoms (54^{m}9 to 128^{m}0). Dangerous seas and tide rips are encountered in the strait during the North-East Monsoon, but they are not reported in the South-West Monsoon.

Directions. When entering the strait from the eastward in the S.W. Monsoon, work to windward with the flood stream, and when this loses its strength, make for the bank north-west or west of Biri island, where anchorage can be had on a sandy bottom until the tide makes again.

On weighing, work according to the direction of the stream, so as to pass through Kapul pass, between Kapul and Dalupiri islands, or through Dalupiri pass, between Dalupiri and Samar islands. The

See Section D. Part III. Note and Caution No. 138 on page 367.

latter is probably the safer, especially coming from the southward. If the tide should turn before a vessel has entered these passages, make for the open bay off Kinagitnan, south of Lipata point, in Samar island. Anchorage can also be had, if necessary, in the channel on either side of Dalupiri island, on a sandy bottom strewn with big stones.

The only danger to guard against at this part is the Diamante rock; this once passed, take either the passage between Naranjo islands and Kapul island or between the Naranjo and Destacado island. This latter route is the better; shaping the course then to pass round the north end of Tikao island.

For information respecting winds, currents, and passages with a fair wind through the strait (which are the same as for steam ships), *see* Eastern Archipelago Pilot, Vol. I.

(3) VERDE ISLAND PASSAGE.—This is the name given to the strait that separates the south-west of Luzon from the north coast of Mindoro. Verde island divides the channel into a northern and southern passage. Both are safe, but the northern, or North pass, is preferred, as the southern one is interfered with by the Bako islets. (*See* Eastern Archipelago Pilot, Vol. I.). It is a favourite route during the North-East Monsoon for vessels coming from the southward. Get to the north under the lee of Negros and Panay islands and from the north-west point of Panay island proceed between Mindoro and Tablas islands to Dumali point, and then on through Verde Island passage and up the west coast of Luzon, thus escaping the strong monsoon that is generally felt on clearing Lubang islands.

(4) PASSAGE INTO THE CHINA SEA, PASSING EASTWARD AND NORTHWARD OF THE PHILIPPINE ISLANDS.—The passage northward will be made with a fair North-East Trade wind, and a gradually increasing north-going current (the Kuro shio) as far as the Balintang or Bashi channels, one of which must be passed through to reach the China sea for Hong Kong, or other destination. For Shanghai or Japan, *see* (c), (ii) and (iii) at the beginning of this sub-section on page 263.

(*a*) *Balintang channel.*—This channel lies in about the parallel of 20° N., and is between the Babuyan islands, to the southward, and the Batan islands to the northward. It is 43 miles wide and, being reputed to be clear of shoals, is frequently used by vessels proceeding by the Eastern route to China.

Current.—In the North-East Monsoon, the speed of the Kuro shio, setting to the northward, and north-westward across the channel, and through it, averages 10 to 35 miles a day. The current has also been known to set to the northward at the rate of 3¼ knots. *See* also Route 1,151 (a) for the current in the South-West Monsoon.

(*b*) *Bashi channel.*—This channel, lying between Y'Ami island and the southern extremity of Formosa, is also frequented by sailing vessels making the eastern passage to China; Gadd rock with a depth of 1½ fathoms ($2^{m}7$) lies in the fairway. At low water the sea probably breaks on Gadd rock, but the vicinity is generally marked by violent tide rips and whirls, which extend more or less the whole distance to Shichesei seki about 45 miles westward; as these indications are not always visible, Gadd rock should be given a wide berth on either side.

In 1947 a depth of 16 fathoms ($29^{m}3$) was reported about 6½ miles south-south-westward of Gadd rock, a little northward of a bank marked by heavy overfalls and sometimes discoloured water, the least known depth on which is 49 fathoms ($89^{m}6$).

Route 1,139.—*Reserved as spare.*

A. (iii) ROUTES NORTHWARD FROM BALI, LOMBOK, OR ALAS STRATEN

"The First Eastern passage"

This route to the northward, commencing at Bali, Lombok, or Alas straten, should be taken in October and November only. The route is more suitable for southward-bound vessels, but even then only in May and when coming from the China sea. It has little to recommend it on account of the adverse current setting to the southward through Macassar strait, often strongly, at all seasons of the year. The winds are boisterous and uncertain at the southern end of Macassar strait, and light and variable at the northern end, while the navigation is difficult throughout almost the whole voyage to the open China sea.

The route runs from each of the straits in the heading of this sub-section across the Java sea into, and through, Macassar strait into the Celebes sea, and thence to the Sulu sea through Basilan strait. It then passes up the west coasts of Mindanao, Negros, and Panay islands, and enters the China sea through Mindoro strait or Verde Island passage. Thence, if bound to Hong Kong work along the coast of Luzon as far as Cape Bojeador before making the crossing.

For the sake of easy reference, the whole route has been divided into three parts; firstly, the description and passage of Bali, Lombok and Alas straten; secondly, the passage through Macassar strait to the Celebes sea; and lastly, the passage from the Celebes sea to the China sea. *See also* Route 1,158.

Route 1,140. Description of, and directions for, Bali, Lombok, and Alas straten (The Central passages)

Of the three straits described in this route, Bali straat is the narrowest and most difficult for sailing vessels. It was formerly preferred by sailing-ships, due to the anchoring facilities it offered. Lombok straat is the widest and much used; but Alas straat is probably preferable as there are no dangers and anchorage can be obtained if necessary, during the calms to which all these straits are more or less subject.

(1) BALI STRAAT.—This strait, which separates Bali island from the east point of Java, is about 50 miles in length, and though only one mile wide at its northern end, opens out to 28 miles at the southern entrance. The chief difficulty to contend with is the currents; and sailing vessels should only navigate this strait by day.

During the easterly monsoon, northward of the area of the Trade winds, the wind is mostly south-south-west and south-south-east to south-east, with a west-going stream; from July to September the wind can be very strong. In the westerly monsoon, a vessel when northward of the trade wind area may be set strongly to the eastward, both by wind and stream.

Tidal streams are influenced by the prevailing winds. The greatest velocity is felt at the narrow (northern) part of the strait, when it has a maximum of 6 to 7 knots. Off Banjoewangi (Banyuwangi) it runs at from 2 to 4 knots. In the westerly monsoon, the north-going stream runs longest and with the greatest strength, and the reverse in the opposite season. The change of direction takes place first on the Java side, and sometimes 2 hours later on the other.

Full details of the Tidal streams are to be found in the Eastern Archipelago Pilot, Vol. II.

(2) LOMBOK STRAAT.—This strait between Bali and Lombok islands, is the most important passage for vessels proceeding between Macassar strait and the Indian ocean, mainly on account of its width and the ease by which it can be navigated. The southern entrance is divided into two parts by Noesa (Nusa)

See Section D. Part III. Note and Caution No. 138 on page 367.

besar and Lembongan eilanden which lie on a detached plateau with depths of less than 100 fathoms ($182^{\text{m}}9$); the portion of the strait westward of these islands is known as Badoeng (Badung) straat.

During the North-West Monsoon sailing vessels average one day to make the passage through to the northward; during the South-East Monsoon the time taken on the passage usually varies from one to three days. Making the passage southward during the North-West Monsoon takes at least one day, but usually more; in the South-East Monsoon this passage is quick, averaging from 16 to 17 hours, but in April and October sailing vessels have experienced great difficulty in getting through the strait southward. February and March are the best months for navigating the strait.

Winds.—During the South-East Monsoon calms are frequent from sunrise to noon, when a fresh southerly wind arises, turning to south-east on the Bali side, and to south-south-west on the Lombok side, blowing strong during the night. In the North-West Monsoon the winds are generally from north-west, sometimes with violent squalls, and a high sea in the northern approach.

Tidal streams.—During the South-East Monsoon the stream setting southward, and during the North-West Monsoon, that setting northward, is strongest. The stream may attain a rate of 6 knots in the narrows between Noesa (Nusa) besar and Lombok eilanden, and of 3½ knots in the wider northern part. For details of these tidal streams *see* Eastern Archipelago Pilot, Vol. II.

Directions for Lombok straat.—From both northward and southward Lombok straat can be easily identified by the high peaks of Bali and Lombok islands, which can be seen from a distance of 80 miles in clear weather; Agoeng (Agung), at the eastern end of Bali, appears as a sharp peak, and Rindjani (Rinjani), in the northern part of Lombok, appears as a double peak showing above the other mountains. Directions for the passage of the strait bound to the northward and to the southward, in either monsoon, are given below. The directions may be followed also by low-powered vessels.

(a) Bound to the northward.

(i) During the South-East Monsoon.—During this monsoon the South-East Trade wind continues through the strait. When nearing the strait keep eastward of the entrance and sight Lombok eiland, taking into consideration that the vessel may be set westward by the monsoon drift. Sail into the entrance close along the south-west point of Lombok eiland and then hold the Lombok side. At this season Noesa besar eiland must never be approached, as in the event of calms, especially with a south-going stream, there is danger of being set on to it.

(ii) In the transition months (March, and the end of October and beginning of November).—If westerly winds predominate hold the Bali eiland side, passing through Badoeng straat; if easterly winds predominate hold the Lombok eiland side. Badoeng straat is always preferable, as anchorage may be obtained there.

(iii) During the North-West Monsoon —Make for Tafelhoek and proceed through Badoeng straat under the Bali eiland shore.

(b) Bound to the southward.

(i) During the South-East Monsoon.—During the South-East Monsoon, with predominating south-east winds, it is advisable to work up under the Bali shore with a north-going stream until Mount Agoeng bears 270°; under these conditions, working to the southward under the north-west coast of Lombok eiland is difficult, and the same applies to the Bali eiland shore southward of the parallel of Mount Agoeng.

(ii) During the North-West Monsoon.—During the North-West Monsoon and in the transition months, Lombok strait from the northward affords no particular difficulties; the remarks on the tidal streams in the Eastern Archipelago Pilot, Vol. II. should be studied.

(3) ALAS STRAAT.—This strait between Lombok and Soembawa eilanden, is frequently used by vessels instead of Lombok straat, and for several reasons it is preferable to all the other passages between the Lesser Sunda islands. There are no dangers in it, the islands in the strait can be approached closely, and anchorage obtained under the coasts of both Lombok and Soembawa eilanden; the numerous conspicuous points and islands make it easy to fix the ship's position.

Tidal streams and monsoon drift.—The tidal streams in Alas straat have a semi-diurnal character, but are influenced to such an extent by the monsoons in the area northward of Bali eiland and Lombok eiland and in the Flores sea, that, in the strength of the South-East Monsoon a predominating stream to the southward may be expected, and in the North-West Monsoon a predominating stream to the northward.

During the period of weak tides (in the week after the moon's quarter) the stream may run continuously in the same direction, i.e., south-going during the South-East Monsoon and north-going during the North-West Monsoon, the tidal influence being only just noticeable by periodical decreases in the rate of the stream. During the period of strong tides (in the week after new moon or full moon), the tidal streams and monsoon drift may oppose and more or less balance each other, so that in the South-East Monsoon there is little or no north-going stream, but a stronger south-going stream, and in the North-West Monsoon the reverse. The maximum rate of these stronger streams is, as a rule, 4 knots, and is only exceeded when the moon's greatest declination occurs during the week after full moon or new moon, when a maximum rate of 5½ knots has been observed.

Winds.—In the South-East Monsoon the wind blows strongly from southward during the greater part of the day, but subsides towards evening, when the land wind from Lombok eiland begins. In the North-West Monsoon variable and baffling southerly winds are often experienced in Alas straat.

Directions for Alas straat.—Approaching from the southward, Alas straat may be identified by the high, rugged land of the south-western part of Soembawa eiland, and the plateau forming the south-eastern part of Lombok eiland. From the northward, Mount Rindjani and the high north-western part of Soembawa eiland are conspicuous, and the islands lying under the coasts of Lombok and Soembawa eilanden will also be visible.

As all the straits eastward of Java are more or less subject to calms, sailing vessels proceeding through Alas straat may find it necessary to anchor; it is, therefore, advisable to hold the Lombok eiland side of the strait, where conditions for anchoring are more favourable.

Route 1,141. Through the Java sea and Macassar strait to the Celebes sea

Having passed through one of the central passages (*See* Route 1,140), steer to pass between Kangean eilanden and Paternoster eilanden (Pulau Tengah), and thence to enter Macassar strait by one of the three channels described below.

MACASSAR STRAIT.—*General description.*—Macassar strait, the great channel between the east coast of Borneo and the west coast of Celebes, is about 400 miles in length. A considerable portion of the western side of the strait is occupied by a broad bank extending from the southern part of the east coast of Borneo, enclosing the Kleine Paternoster eilanden in the northern part, and the Lima eilanden in the southern part. The southern and widest part of this bank, southward of Semarang shoal (*Lat. 2° 43′ S., Long. 118° 07′ E.*), contains few islands, but many coral heads rise steeply from the bottom; these are usually of small extent, and most of them have a depth of over 5 fathoms (9m1) over them. Except over a distance of about 60 miles at the southern end of the bank, covering the Lima eilanden and Laurel riffen, there are large areas free from dangers, where vessels may cross between Borneo and Celebes, although vessels crossing the strait usually proceed westward and northward of the Kleine Paternoster eilanden.

Southern entrance.—Between the Lima eilanden and the adjacent reefs, lying on the edge of the great bank extending from the Borneo coast, and the Spermonde archipel, off the southern part of the west coast of Celebes, are a number of isolated coral banks, rising abruptly from great depths, with raised ridges and islands on their northern and eastern edges. These coral banks comprise two distinct groups, thus dividing this portion of the southern entrance to Macassar strait into three main channels.

The middle one of these three channels is to be preferred for entering the strait, though the eastern one is also frequently used, especially by vessels bound for Macassar. In the latter case the Spermonde archipel and its associated bank rises so steeply from depths of over 100 fathoms (182m9) that sounding will give no indication of a vessel's approach. The western of these three channels is seldom used, partly owing to the fact that no land is visible, which makes it difficult for a vessel to determine its position and to avoid Sibbalds bank, lying in the southern entrance, and partly because no saving of distance is effected.

Some 150 miles to the northward of the above channels the strait is again divided into two channels by Balabalagan and Kleine Paternoster eilanden. The width of the western channel is 20 miles, and of the eastern 45 miles. There are some dangers in the western channel, but it is nevertheless much frequented, and for some reasons preferred to the eastern, on account of the more moderate depths off the coast of Borneo, which permit of anchoring in case of necessity, while the Celebes coast is steep-to in many places, and destitute of anchorage.

Having passed northward of Kleine Paternoster eilanden there is no difficulty in navigating through the remainder of Macassar strait into the Celebes sea.

Winds in Macassar strait.—In Macassar strait the monsoons are not so marked, and their strength is less than in the Java sea. As most passages through are taken on one or other side of the strait, it is essential to remember that near the shores land and sea breezes blow through the whole year, and that the direction of the coast, with local topographical features, may greatly influence the force and direction of the wind then blowing in the body of the strait. Land breezes may be expected between about 1900 and 0700, and sea breezes from 1000 to 1700. Where the monsoon is strong on a lee shore, the land wind may not be felt at sea.

In April the easterly monsoon sets in, over the southern part of the strait, blowing from north-east to south-east, but calms and north-west winds are also experienced; this unsettled weather lasts until June, when the wind begins to blow with some regularity from the south-east quarter, occasionally shifting to south-westward; at night, in this month, the wind is mostly from east to south-east, but frequently, also, from south and south-west. These winds will cause, some swell, and, blowing in opposition to the prevailing southerly current, produce a short and troubled sea.

In September and October the wind and sea decrease, and, changing through south and west, the winds blow from westward in November, and in December from south-west to north-west, but they cannot be relied on.

In January the monsoon is at its height, blowing from north-westward, with heavy squalls, much rain, and sea, which begin to abate in February, and in March there will be light breezes from north-west to north-east and east.

The greatest rainfall occurs from December to March, but there are showers in all other months, the least in July to September.

Squalls and thunderstorms are most frequent in December, but may occur in practically any month.

In the northern portion of the strait, the wind force is still less, the monsoons—from northward and south-south-westward—are uncertain and depend much on the strength of the several winds in the China and Java seas; the seasons are feebly defined, with much rain.

South-south-west winds begin in May, veering occasionally to west and north-west, and blow somewhat unsteadily. From June to September the monsoon is at its height, and south-south-westerly winds prevail day and night. In October the monsoon decreases in force, and is weakest in November, the wind sometimes veering northward and north-eastward. In December the general direction is north-west, in January north, and in February north-north-east winds blow with some steadiness, decreasing in April, when calms and uncertain breezes are expected.

There is less cloud in the northern than in the southern part of the straits, but the rain is heavier, and, in all parts, the fall is greater on the Borneo than on the Celebes side. The wet season is from November to March, and the dry season from July to September.

Squalls and thunder are infrequent, but mist, a rare phenomenon in these regions, is often seen.

Currents, tidal streams and monsoon drift.—In the open part of Macassar strait there is generally a constant southerly current, with an average rate of 0.7 knot, but a maximum rate of 2 knots has been observed; southward of the southern entrance there is a constant westerly current.

The drift caused by the wind is never sufficiently strong to counteract the constant current, but during the North-West Monsoon the south-going current in the southern part of the strait is deflected to the south-eastward, and in the South-East Monsoon to the south-westward.

In the area within the 100-fathom (182m9) line between the Lima eilanden and the Kleine Paternoster eilanden the direction of the current is governed by the prevailing wind, and it is not influenced by either the weak tidal movement or the constant current.

In the great bight southward of Tanjong Mangkalihat (*Lat. 0° 58′ S., Long. 119° 00′ E.*) there is a constant eddy in a northerly direction along the Borneo coast, with a rate of half a knot; just outside this point the constant south-going current sometimes runs at a considerable rate. Close under the Borneo coast the influence of the tidal streams is felt. For further details *see* Eastern Archipelago Pilot, Vol. II.

Route 1,142. Celebes sea to the China sea

The route northward is, as already stated at the beginning of this sub-section (iii), through Basilan strait into the Sulu sea, and thence by Mindoro strait, or Verde Island passage into the China sea. Mindoro strait, which is more frequently used by vessels southward bound, is described in Route 1155; Verde Island passage has already been described in Route 1,138 (3). A description of Basilan strait and of the Sulu sea follows below.

(1) BASILAN STRAIT.—This strait, open from west to east, separates the south-western end of Mindanao island from Basilan island; it is 8½ miles wide and 24 miles in length. The Santa Cruz islands and banks, situated on the Mindanao island side, divide it into two deep channels, both equally navigable; the northern channel, although the narrower, is generally preferred by sailing vessels, as it offers the advantage of anchorage on the coast of Mindanao in the event of a calm, thus avoiding being carried away by the current.

Tidal streams.—These follow the direction of the channel in either direction, that is approximately to the westward or to the eastward; they attain a rate of 2 to 3 knots at neaps and 5 to 6 knots at springs. *See* Eastern Archipelago Pilot, Vol. I. for further details.

(2) THE SULU SEA.—This is the space included between Mindoro island on the north, and the Sulu archipelago to the south, having Panay, Negros and Mindanao islands on the east, and Palawan island on the west. It is of great depth, and is connected with the Pacific Ocean by San Bernardino and Surigao straits, and with the China sea by Mindoro strait, Verde Island passage, and Balabac strait.

Winds.—In October, easterly winds with fine weather prevail. The North-East Monsoon is established in November and blows hardest in January and February, though not so strongly as in the China sea. At the end of May, south-west winds begin to blow; the monsoon becomes established in June, and ends in October. Rain squalls and tempestuous weather are common throughout this period, being most frequent in July and August. In September a heavy mist hangs over the coast of Mindanao.

Currents.—The waters in and around the Philippine islands and in the Sulu sea are subjected to the influence of the monsoon currents, and of the North Equatorial current. For details *see* Eastern Archipelago Pilot, Vol. I.

CAUTION.—The southern part of the Sulu sea and the Sulu archipelago are as yet incompletely surveyed, and these waters should therefore be navigated with caution. Generally speaking, navigation in all these waters requires caution, on account of irregular and uncertain currents and of the prevalence of coral formations, which may have escaped detection, even in recent detailed surveys, and of which the soundings very often give no warning.

In navigating the waters of the Philippines during the rainy season a sharp look-out must be kept for flotsam. Trees of immense size will be frequently met afloat. They have been found especially numerous on the south-coast of Luzon; in one case, near Marinduque, a group of them was adrift, still upright, and resembling an island.

Route 1,143.—*Reserved as spare.*

B. ROUTES SOUTHWARD BOUND THROUGH THE EASTERN ARCHIPELAGO

In this section of Chapter II. only the actual passages through the Eastern archipelago are described, but a brief summary of the routes to be followed from the China sea is given below. More detailed directions for the latter will be found in Section C., Part III., of this book. *See* Route 1,314.

There are three principal routes for vessels southward-bound from the China sea through the Eastern Archipelago.

(i) The Western route through the China sea westward of the Philippine islands and of Borneo to Soenda (Sunda) straat, either direct or via Singapore.

(ii) The Eastern route through the China sea, eastward of the Philippine islands to Djailolo passage, and thence to Ombai straat or to one of the central passages (Alas, Lombok or Bali straten).

(iii) The Central route, westward of the Philippine islands and eastward of Borneo, through Macassar strait to one of the central passages.

Of these three routes (i) and (iii) are those used by vessels from southern ports in China (Hong Kong, etc.); (iii) is also used from Manila and southern Philippine ports, or eastern ports of Borneo; (ii) is used by vessels from northern ports in China (Shanghai, etc.), or from Japan. In the strength of the South-West Monsoon vessels from the southern ports of China sometimes use (ii).

Section B of this chapter is divided therefore into three sub-sections each dealing with one of the routes above.

(i) THE WESTERN ROUTES.—TO SOENDA (SUNDA) STRAAT

General remarks.

The general seasonal directions for the passage from Singapore, or from the China sea, to Soenda straat are given first, followed by detailed information regarding the various channels on the routes.

Singapore to Soenda straat.—This passage is best made during the North-West Monsoon period (October to April), and there are then two principal passages; one by Riouw (Rhio) straat, southward to either Banka or Gaspar straten; but in October, in Gaspar straten only, on account of the calms and baffling winds then prevailing in the waters between Riouw and Banka straten; and the other, known as the Inner Route, by Doerian, Berhala and Banka straten to Soenda straat. Riouw straat, as well as Berhala straat, are particularly convenient for sailing vessels leaving Singapore for Europe in the North-West Monsoon (North-East Monsoon of the China sea). By proceeding through either, they avoid the delay and inconvenience so frequently experienced during that season in getting to sea by the main channel of Singapore strait, eastward of Horsburgh lighthouse.

During the South-East Monsoon, the ordinary route would be to beat out through Singapore strait to the eastward, and work to the southward by Karimata or Gaspar straten to Soenda straat. At the same time, vessels are frequently able to proceed much more quickly to the southward by the Inner Routes than by the outer one. Convenient anchorage is always available in the straits for sailing vessels held up by wind, or tidal streams.

China sea to Straat Soenda.—During the North-East Monsoon, a vessel arriving in the southern part of the China sea, either eastward or westward of the Anamba islands, would proceed southward through Banka or Gaspar straten; but during October the former should not be attempted, owing to the calms and baffling winds which occur during that month in its northern approaches.

During the South-West Monsoon, a vessel from the Palawan passage, or having crossed to the Borneo coast from Cape Padaran should proceed by Karimata or Gaspar straten.

An index will be found at the beginning of this chapter on page 247, showing the various routes

See Section D. Part III. Note and Caution No. 138 on page 367.

through the Eastern archipelago, and giving details of the channels and their route number, for easy reference.

In this sub-section (i) of section B., the routes southward through Riouw, Banka, Gaspar and Karimata straten, will be described first; then the passage onward to Soenda straat; and finally the passage through Soenda straat to the Indian ocean.

Of the other channels mentioned in the passage from Singapore or the China sea to Soenda straat, Singapore strait is described in Route 1,127; and the directions for the passage through Doerian straat and Berhala straat to Banka straat are the reverse of those given in Route 1,126, "Banka straat to Singapore strait by the Inner route."

Route 1,144. Passage southward through Riouw (Rhio) straat

Vessels having a fair wind leaving Singapore at high water, or about the first quarter of the ebb or east-going stream, and taking about 4 hours to reach the entrance of Riouw straat, will probably carry a fair tidal stream through both straits, but no dependence can be placed on it. *See* Eastern Archipelago Pilot, Vol. IV.

The directions previously given for coming northward, through Riouw straat, if reversed, will suffice for proceeding southward (*See* Route 1,125). Vessels of heavy draught should pass eastward of Pan rif.

At night.—Steer to pass about three-quarters of a mile eastward of Pan rif light, from which position Toendjoek leading lights, which mark the fairway between Nginang eilanden and Orion rock, will be in line bearing 180°. When Terkoelai light is open southward of Lobam eiland bearing 100°, and the vessel is southward of Orion rock, shape course about 135°, allowing for tide, until Karas kechil light bears 154°, when it may be steered for on that bearing. Pass about half a mile or more eastward of it, and then keep it astern, bearing about 320° or less, as long as it is in sight, to lead in the fairway southward of the strait.

Route 1,145. Approach to, and passage southward through Banka straat

A general description of Banka straat together with notes on the winds and tidal streams will be found in Route 1,123 (1). The caution in the same route, regarding the determination of a vessel's position, should be noted.

With a fair wind.—When coming from the northward, and having passed Toedjoe eilanden, situated about 50 miles northward of Banka straat, and steering to the southward to pass through Banka straat, there will be no difficulty in clear weather in determining a position, which can be readily done by cross bearings of Penjaboeng (Penyabong), and Menoembing (Menumbing) hill, on the east side of the entrance; under such circumstances enter the strait eastward of Frederik Hendrik klippen. In thick weather it often happens that no land can be seen until the vessel has arrived very near to the entrance of the strait, and at such times it is important to get hold of the bank extending from the Sumatra coast, and then proceed along its edge in low water depths of from 8 to 6 fathoms ($14^{m}6$ to $11^{m}0$), carefully attending to sounding. Sometimes Menoembing hill will be seen, but no other land, and in such case it will be prudent to proceed as before, keeping along the edge of the bank.

Working through Banka straat from the northward.—The passage westward of Frederik Hendrik klippen is much to be preferred when the land is obscured and reliable bearings cannot be obtained; at other times the eastern channel is preferable. By reversing the directions previously given in Route 1,123 for working through from the southward, no difficulty will be experienced in navigating Banka straat. *See* also Route 1,123 (2) for directions for Lucipara and Stanton passages; the directions should be taken in reverse.

Route 1,146. Approach to, and passage southward through, Gaspar straten

The general description of Gaspar straten will be found at the beginning of Route 1,128; full details are given in the Eastern Archipelago Pilot, Vol. IV. The directions for this route follow these general remarks, and are given first for the approach to Gaspar straten from the northward, followed by brief directions for the passage of Macclesfield channel, and notes regarding Stolze straat and Clement channel.

Although the navigation of this strait is complicated by the many dangers which exist, yet, as the course by it is more direct, and the prevailing winds are more favourable, and the distance less than by perhaps the safer route through Banka straat, many seamen prefer it, especially when returning from China late in the North-East Monsoon.

(1) Approach to Gaspar straten from the northward.—In consequence of the northern entrance of Gaspar straten being so near the equator, the winds, even in the strength of the monsoons, are very uncertain, producing a corresponding uncertainty in the direction and force of the tidal streams and currents. A sailing vessel approaching the strait from the northward will, therefore, have to be principally guided by the winds and currents which may have been encountered rather than by relying upon those which are mentioned to have been experienced at certain seasons and described in Eastern Archipelago Pilot, Vol. IV.

In thick weather the greatest caution is necessary when approaching Gaspar straten, for unless good observations can be obtained there is no means of ascertaining an exact position, and, under such circumstances, it is advisable to steer for Banka straat, where the soundings, on the edge of the bank extending from the Sumatra coast, may be a useful guide, although the land may not be distinguished. *See* Route 1,145.

When approaching the north-east coast of Banka eiland use every precaution not to get entangled among the outlying dangers when running southward for Gaspar straten in thick weather, some of which are over 40 miles from the shore, between Tanjong Berikat and Tanjong Toeing (Tuing), a distance of about 75 miles apart.

Early in the North-East Monsoon when the wind is generally from north or north-west, and intending to go through Gaspar straten, pass between Toty and Dokan islets, off the north coast of Banka eiland; a little later in the monsoon the wind is more easterly, and it is then better to pass from 10 to 20 miles eastward of Toty islet.

Cross bearings of the Banka eiland mountains, in clear weather, will enable a vessel to clear Iwan and Severn reefs, which lie in the track to Gaspar straten. *See* Eastern Archipelago Pilot, Vol. IV. If passing northward of Severn reef, steer so as to get on the meridian of Gaspar island before reaching the parallel of 1° 50′ S. Gaspar island is visible, in clear weather at a distance of over 30 miles, but it is not visible from Lanrick reef, the northernmost danger, for which a careful lookout is necessary. When Gaspar island comes in sight, bring it to bear 180°, which leads clear of all dangers lying to the westward. Then pass eastward of Gaspar island and shape course for Macclesfield channel, which is the passage usually taken.

The above directions apply only to sailing vessels coming from China early in the North-East Monsoon. In general, and especially returning late in the monsoon from China, when south-east and easterly winds are often met with between Banka and Billiton eilanden, it will be better to pass from 10 to 12 miles westward of Pedjantan (Pejantan) or St. Barbe, 748 feet ($228^{m}0$) high, near the equator, and endeavour as soon as possible to get on the meridian of Gaspar island. When that island is seen, bring it to bear 180°, and proceed as before.

Late in the North-East Monsoon also, south-south-west winds are often met in the southern part of the China sea, obliging vessels to keep further east towards the islands off Borneo. If this should happen in May or June, it would be tedious work getting to Macclesfield channel, and therefore steer for Langkoeas eiland off the north-west point of Billiton eiland, and pass through Stolze straat. *See* (3) below.

At night.—Gaspar straten can only be approached from the northward at night by passing eastward of all the dangers lying northward of it. Having passed well to the westward of Florence Adelaide reefs, shape course for Langkoeas light, and when it comes in sight, alter course to pass about 4 miles westward of Langir eiland.

(2) PASSAGE SOUTHWARD THROUGH MACCLESFIELD CHANNEL.—In the early part of the North-East Monsoon, northerly and north-westerly winds prevail about the entrance of Gaspar straten, when strong south-easterly currents will generally be experienced between Gaspar island and Pulau Liat, especially near Alceste reef, at its northern extreme. Neglect to guard against the effect of this current has led to frequent accidents.

Therefore, if intending to proceed to the southward through the Macclesfield channel, and having passed from 1 mile to 2 miles eastward of Gaspar island, steer to the south-westward until Gaspar island bears 014°, upon which bearing it should be kept until the south-east extreme of Pulau Kelapan (Kilapan) bears 236° and the north point of Pulau Liat 125°. Here being in the fairway of the channel, steer about 185° to pass between the dangers off Tjelaka (Chelaka) eiland and Discovery rocks, carefully guarding against the effects of tidal streams or currents by frequent cross-bearings.

The directions given in Route 1,128 (1), reversed, will apply to the remainder of the channel.

CAUTION. *See* Caution under Route 1,128 1(a).

(3) PASSAGE SOUTHWARD THROUGH STOLZE STRAAT OR CLEMENT CHANNEL.—The remarks on these two channels, and the directions for Stolze straat, which are contained in Route 1,128 (2) and (3), apply also to the passage southward, when taken in reverse.

The current in Stolze straat being weaker than elsewhere, it is the best channel to use for working through during the South-East Monsoon period.

Route 1,147. Approach to, and passage southward through, Karimata straat

A general description of Karimata straat and the passage through it to the northward, will be found at the beginning of Route 1,132; notes on, and directions for, the Inner and Greig channels are also given in that route.

(a) North-West Monsoon.—Main channel route.— (*See* Route 1,132 (2) (a)).—During the North-West Monsoon, take the channel eastward of Ontario reef. Approach Seroetoe eiland with its summit bearing less than 152°, and thence pass 4 or 5 miles westward of the lighthouse, observing that the west extreme of the island kept bearing less than 354° leads eastward of Ontario reef. Thence gradually bring the summit of Seroetoe eiland to bear 335° astern, until lost sight of, which direction being preserved leads well to the eastward of Catherine reef. From a position 10 miles eastward of Catherine reef, steer 170° through the fairway, and about 5 miles eastward of Discovery East bank lighthouse, clear of all dangers.

(b) South-East Monsoon.—Greig and Inner channel routes.—From the northward, when the South-East Monsoon is strong, smoother water and less current will be obtained in Greig and Inner channels. *See* Route 1,132 (2) (b) (i) and (ii).

Route 1,148. Banka, Gaspar or Karimata straten to Soenda straat

CAUTION. Dangerous shoals extend for about 35 miles to the southward of Gaspar straten, rendering great caution necessary when leaving it and making for Soenda straat.

Having cleared the shoals southward of Gaspar and Karimata straten, the route to Soenda straat is the same as from Banka straat now described.

(*a*) *With a fair wind.*—After passing eastward of Five Fathom banks, in depths of from 10 to 12 fathoms ($18^{m}3$ to $21^{m}9$), steer to pass a prudent distance westward of Noordwachter (North Watcher) lighthouse and eastward of Brouwers banken and Lynn reef; from thence reverse the directions given in Route 1,122 for proceeding northward.

(*b*) *Working southward.*—Westward of Five Fathom banks, reverse the directions for working northward as given in Route 1,122, and observe the caution for anchoring at night when the position is at all doubtful. Clifton bank, with a least depth of 2¾ fathoms ($5^{m}0$) over it, eastward of Tanjong Sekopong, will be avoided by keeping Gebroeders (Two Brothers) bearing more than 180°, and when southward of them, the islands bearing less than 360° will lead eastward of Swallow reef, which has a depth of 4½ fathoms ($8^{m}2$) over it.

CAUTION. In the easterly monsoon, when the atmosphere is hazy and the coast rarely visible, great care is necessary in passing Gebroeders (Two Brothers), which from northward appear as one.

Route 1,149. Passage southward through Soenda (Sunda) straat

The general description of Soenda straat, together with the winds, sea and tidal streams to be expected therein, are given in Route 1,121 (1) (a), (b), (c) and (d).

(a) South-East (or easterly) Monsoon (April to September).—Keep in the main fairway when the wind is favourable; but if proceeding through Behouden passage (Princes channel) keep closer to the Java coast than to Prinsen eiland. This route may be taken also at the beginning of the westerly monsoon, up to about the end of December if conditions are favourable.

The monsoon is generally supposed to shift at about the beginning of October, but often is delayed for a month; the interval being filled with calms, light southerly winds, and frequent heavy Sumatra squalls, or south-westers. These squalls at this season generally take place at night, accompanied by heavy rain, thunder and lightning, and are of short duration.

(b) North-West (or westerly) Monsoon (October to April).

(i) Northern route.—During the strength of the westerly monsoon, January and February, the western channel, between Dwars in den weg (Thwart-way) and the Zutphen eilanden, is recommended, giving those islands a berth of 1½ miles, and thence working north-westward to Varkenshoek.

Should night be approaching when the Zutphen eilanden or Pulau Soemoer are sighted and the strong south-west winds encountered, with an adverse stream, vessels will do well to seek anchorage under Steile hoek or Tanjong Soemore Batoe at the north end of the islands, or off Sindoe (Sindu) eiland at the south end within Kandang Balak eiland, until the stream turns, when the vessel should immediately be got under way. From the latter proceed with the morning land breeze.

Working through the passage between Seboekoe (Sebuku) eiland and Sumatra, pass on whichever side of the Tiga eilanden the strong currents and hard squalls will allow, and thence northward of Serdang eiland, and between it and Sioentjal (Siunchal) eiland; or, alternatively, pass northward of Legoendi (Legundi) eiland and out through Legoendi straat *(See Note below)*, avoiding Medusa reef of 2¾ fathoms ($5^{m}0$) north-eastward of Seserot islet, passing on either side of that island in mid-channel. In this manner a quick passage may be made through the strait if the wind be not too variable, besides having the advantage of anchorage being available on the east side of Seboekoe eiland or on the west side of Lampoeng (Lampung) baai if the current or wind prove too strong.

Note.—Legoendi (Legundi) straat.—This strait, between the Sumatra coast and Legoendi eiland, is 2 miles wide, and recommended to sailing vessels working out of Lampoeng baai in the westerly monsoon. In the middle of the strait is the high islet of Seserot, with depths of 10 to 30 fathoms ($18^{m}3$ to $54^{m}9$) around; on the north-east side is a small reef, and off the south-west end lie some high rocks. The passages on either side of Seserot islet are equally good, and, with contrary winds or current, there is anchorage on the east side of the island in 10 or 12 fathoms ($18^{m}3$ or $21^{m}9$) sand. Vessels drifting through the strait in a calm will be carried past the island by the off-set of the current. Westward of Legoendi straat is Telok Kiloean (Kiluan), where safe anchorage may be found, if required, by vessels with local knowledge only. Sailing vessels may run out with the land wind, which blows here from the northward, but it is recommended to have a boat in attendance to tow, lest they should get becalmed under the high land; it is advisable to pass close westward of Tanjong Toentoengkalik.

(ii) Southern route.—Behouden passage (Princes channel).—There are, on record, many instances of vessels having worked out of the strait along the coast of Java, and through Behouden passage, during the westerly monsoon, with more ease and celerity than could have been effected by stretching into Lampoeng baai (Lampung bay), in consequence of the south-westerly current from the Java sea having then developed its chief strength along the eastern side of the strait. *See* Tidal streams, Soenda straat, in the Eastern Archipelago Pilot, Vol. IV. It is, however, a lee, and therefore a dangerous, shore at this season.

In spite of this, cases are on record in which vessels have worked through Behouden passage in a remarkably short time during a westerly gale, by carrying a heavy press of sail and tacking between the squalls, when it was impossible for any vessel in the channel north of Prinsen eiland (Great channel) to beat against the current and heavy sea. In this monsoon, particularly when working out, it is advisable to keep nearer the island shore, to obtain the help of a current sometimes running to the westward, and to avoid being set upon the rocks about Java hoofd by the heavy swell. Near the Java shore, when outside anchorage depths in a calm, vessels would be in considerable danger.

Route 1,150.—*Reserved as spare.*

B. (ii) THE EASTERN ROUTE.—TO OMBAI STRAAT OR TO ALAS, LOMBOK OR BALI STRATEN

From the China sea from the middle of May to the end of July

During the strength of the South-West Monsoon, the best route from Hong Kong and adjacent coast ports is to pass northward of the Philippine islands, through the Bashi or Balintang channel, and then steer, either along the east side of the Philippines, or to the south-eastward towards the Palau islands.

When the easterly monsoon is encountered, shape course to pass eastward of Halmahera eiland, through Djailolo passage or Dampier straat to the Halmahera sea and thence to the Ceram sea; alternatively a vessel may pass to the Ceram sea from the Pacific ocean through the Molucca sea.

From the Ceram sea pass to the Banda sea either through Manipa straat, east of Boeroe eiland, or by passing west of Boeroe eiland; then continue through the Banda sea to Ombai straat, or through the Flores sea to Alas, Lombok, or Bali straten; if bound to Bali straat, the usual route is via Sapoedi straat.

For the convenience of easier reference the whole route will be divided into three parts; firstly from the China sea to the Pacific ocean through Balintang or Bashi channels; secondly from the Pacific ocean to the Ceram sea; and lastly from the Ceram sea to the Indian ocean.

Route 1,151. China sea to Pacific ocean via Balintang or Bashi channels

(a) Via Balintang channel.—This channel lying on about the parallel of 20° N. is about 43 miles wide and reputed to be free from dangers; it is frequently used by sailing-vessels proceeding from China by the Eastern passage of the Eastern archipelago. *See* also Route 1,138 (4) (a).

Currents.—In the South-West Monsoon, the north-going current from the China sea flows north-eastward through Bashi and Balintang channels at the rate of 40 miles a day. It has no permanency, however, and often sets north-westward, or northward, with a speed occasionally, of 3¼ knots. *See* also Route 1,138 (4) (a).

(b) Via Bashi channel.—A description of this channel, which lies on the parallel of 21° 30′ N., will be found in Route 1,138 (4) (b). Bashi channel is also used by sailing-vessels making the Eastern passage from the China sea.

Currents.—See under (a) opposite column.

For a fuller description of the above channels *see* China sea Pilot, Vol. III.

Route 1,152. Pacific ocean to the Ceram sea

As already mentioned at the beginning of this sub-section, this part of the Eastern passage can be taken via Djailolo passage, or Dampier straat, or through the Molucca sea. The latter is not recommended during the period middle of May to the end of July; it might be taken with advantage after September.

(a) Via Djailolo passage.—This deep channel lying between Moeor (Muor) and Gébé eilanden presents no difficulty except from the strong tidal streams, often accompanied by whirlpools and tide rips, off the north-western extremity of Gébé eiland.

Having passed through Djailolo passage steer through the Halmahera sea to enter the Ceram sea through one of the channels between the chain of islands about 70 miles to the southward. The channel between Pisang and Boo (Bo) eilanden is recommended for sailing vessels during the South-East Monsoon.

(b) Via Dampier straat.—This is an alternative route to Djailolo passage; a description of the strait and the tidal streams to be expected therein is given in Route 1,137.

In approaching from the eastward, Tanjong Momfafa should be made out, a good berth being given to the shoals, which extend about 6 miles eastward, and which may be avoided by keeping Wajam eiland bearing more than 245°; then proceed, reversing the directions given under the above named route, and in Eastern Archipelago Pilot, Vol. III. *See* also the Note under the directions for Dampier straat in Route 1,137, which applies equally well when coming from the eastward.

Having passed through Dampier straat proceed as in (a) above.

(*c*) *Via the Molucca sea.—See* Route 1,137, "Molucca sea" for a general description of this wide passage from the Pacific ocean. It is sometimes used by sailing vessels homeward bound from China, and, after September, with advantage: but it is a tedious passage to beat through, as the currents set with the wind at the rate of from 16 to 24 miles a day. When it is difficult to get to the southward by the channel between Soela eilanden and Obi Major, sailing vessels might try to do so, by keeping near the west coast of Halmahera eiland and passing through Patientie straat, between Halmahera and Batjan (Bachan) eilanden, and thence through Obi straat and Tobalai straat to the Ceram sea.

Route 1,153. Ceram sea to the Indian ocean via Ombai straat or via Alas, Lombok or Bali straten

The recommended route is to pass through Manipa straat into the Banda sea and thence proceed as directly as possible to Ombai straat or to Alas, Lombok or Bali straten.

Alas, Lombok and Bali straten are described in Route 1,158, in which directions for the passage southward are also given. A description of, and directions for, Manipa straat and Ombai straat follows.

(1) MANIPA STRAAT.—This is a good and safe passage out of the Ceram sea to the southward, lying between Boeroe eiland on the west, and Manipa eiland on the east. The port of Ambon (Amboina) lies about 50 miles to the south-east of its southern end, and forms a convenient port of call.

Directions.—In passing through the strait, when coming from the northward in the South-East Monsoon, keep towards the west side of Manipa eiland, where there will be less influence from the north-going current. *See* also Route 1,136 (2),andEastern Archipelago Pilot, Vol. III.

(2) OMBAI STRAAT.—Descriptions of Ombai straat, and of the winds and weather and the tidal streams are given at the beginning of Route 1,136. Near the land, the tidal streams are said to be stronger than the main current, but under the islands on the north side of the strait currents are said to be exceptionally weak.

Route **1,154.**—*Reserved as spare.*

(iii) THE CENTRAL ROUTE VIA MACASSAR STRAIT

From the China sea in May only

This route is the same, but in reverse, as the "First Eastern passage" described in A (iii) above. It is intended for vessels leaving China at the end of April or the beginning of May. *See* the remarks at the beginning of A (iii) on page 266.

Summarising the route, a vessel should steer from the vicinity of Macclesfield bank, to pass through Mindoro strait, and thence across the Sulu sea to the Celebes sea via Basilan strait or Sibutu passage; Basilan strait is recommended for sailing vessels, though Sibutu passage is sometimes used. The voyage now continues through the Celebes sea and Macassar strait into the Java sea, through which either of two routes may be taken, namely to Soenda straat or to one of the central passages, Alas, Lombok or Bali straten. Vessels bound to the last named usually pass through Sapoedi (Sapudi) straat.

For the convenience of reference the whole passage has been divided into four routes; first, through Mindoro strait into the Sulu sea; then across the Sulu sea via Basilan strait or Sibutu passage to the Celebes sea and Macassar strait; then through Macassar strait and the Java sea; and lastly from the Java sea to the Indian ocean through Alas, Lombok or Bali straten, or through Soenda straat.

Note.—If desired a vessel may pass from the Celebes sea to the Banda sea via the Molucca sea, Ceram sea and Manipa straat. Otherwise as above.

Route 1,155. Passage through Mindoro strait into the Sulu sea

The wide Mindoro strait, separating the Kalamian (Calamian) islands from Mindoro island, is one of the most frequented channels for sailing vessels which leave Manila for India towards the end of April, and throughout the South-West Monsoon period; and by other vessels at all times of the year from the ports of China to Australia. It is divided into two passes by Apo island and reef. A light is exhibited on the north-eastern side of Apo island and another near the eastern extremity of the reef. Discovery bank, with a depth of 9 fathoms (16$^{\text{m}}$5) over it is marked (1948) on its northward side by a light-and-bell buoy.

Apo West pass, between Apo reef and the north-eastern islands of the Kalamian group, is about 20 miles wide and is deep throughout the fairway. Merope rock with a depth of $2\frac{1}{4}$ fathoms (4$^{\text{m}}$1), and Hunter rock with a depth of $1\frac{1}{4}$ fathoms (2$^{\text{m}}$3) lie in the northern entrance; the sea breaks on both rocks.

Apo East pass, between Apo reef and the western side of Mindoro island is about 15 miles wide, and, with the exception of Discovery bank *(see* above), is deep and clear of dangers.

Weather.—Current.—Land and sea breezes are felt on the coasts of the larger islands in Mindoro strait, mostly during the South-West Monsoon and in the periods between the monsoons; they are not so regular during the North-East Monsoon. *See* Eastern Archipelago Pilot, Vol. I.

The set of the current in Mindoro strait depends chiefly on the prevailing wind; a current setting south-eastward at the rate of 0.6 knots has been observed.

CAUTION. The second paragraph of the Caution at the end of Route 1,142 should be noted.

Route 1,156. Passage through the Sulu sea to Macassar strait

Making to the southward through the Sulu sea, it is best to keep on the eastern side along the coast of Panay island, and through Basilan strait. The more direct route from Mindoro strait southward towards Sibutu passage is not recommended, but, as it is sometimes used, a brief description of the passage is given below.

Basilan strait and the Sulu sea are described in Route 1,142.

Sibutu passage separates the islands fronting Darvel bay, in the north-east of Borneo, from the Tawitawi group of the Sulu archipelago; it is a safe and deep channel 18 miles wide between Sibutu island on the west and Simunul (Simonor) island on the east.

Tidal streams.—When navigating Sibutu passage, great attention must be paid to the tidal streams, which run at a rate of 2 to 5 knots; at times the

See Section D. Part III. Note and Caution No. 138 on page 367.

south-going stream attains a rate of 6 knots. For details *see* Eastern Archipelago Pilot, Vol. I.

Directions.—No special directions for sailing vessels are available, but the following remarks are extracted from a report by the Master of the s.s. *Phorus*, in December 1921:—" When approaching from the northward it is advisable to make Pearl bank by day; in any case, the navigation of Sibutu passage is quite safe by night after passing Pearl bank, as Sibutu hill and Bongao island are discernable even on the darkest nights."

" When making Sibutu passage from the southward, the best time to approach is at dawn, as rain is less frequent then than at any other time of the day, and the light on Saluag islet may not be seen."

Passage across the Celebes sea.—Having passed through Basilan strait or Sibutu passage, make for the northern end of Macassar strait; no dangers have been reported in the Celebes sea on these routes except one, taken from a Spanish chart of 1874, in an approximate position lat. 5° 30′ N., long. 122° 04′ E.; its existence is doubtful.

Route 1,157. Passage through Macassar strait and the Java sea

A full description of Macassar strait and the winds, currents, tidal streams and monsoon drift to be expected therein is given in Route 1,141.

Passing through the strait, the Borneo side provides anchorage in case of need; the coast of Celebes is steep-to. Although there are some dangers in the channel westward of Kleine Paternoster eilenden, it is nevertheless much frequented for the same reason.

On leaving Macassar strait, and entering the Java sea, course must be shaped for Soenda straat or for the northern entrances of one of the three passages between the islands immediately eastward of Java, namely (from east to west) Alas, Lombok and Bali straten. Of these, Alas straat is probably the best at all times for sailing ships; Lombok straat is also recommended during January or February; and Bali straat at other times during the North-West Monsoon.

If bound for Alas straat or Lombok straat steer to pass about 20 miles eastward of the dangers on that side of Kangean eilanden. If bound for Bali straat the usual route is through Sapoedi straat, the description of which follows.

Sapoedi straat is 7 miles wide and is a good and safe channel with no dangers beyond those of Tembaga, which dries, and Jacoba Elizabeth with a depth of 7 fathoms ($12^{m}8$), lying on the western side; it is preferable to either that west of Gali Jang (Gili Yang) or east of Sapoedi eiland.

Winds.—In Sapoedi straat and passages eastward, including Kangeang eilanden, the South-East Monsoon prevails from April to October, and the North-West Monsoon from November to March. In April and May all winds are southerly, in June the monsoon becomes dominant from south-south-east to south-east, and blows with greatest strength during July, August and September. In November winds are northerly, alternating with rain squalls from all points; in December north and north-west winds last longer and squalls come from north-west or west-north-west; January and February are marked by very squally weather from north-west to north, and in March it often continues to blow stiffly from west to west-north-west.

Currents.—These run southward in the South-East Monsoon, and northward in the North-West Monsoon, causing a very troubled sea during the height of those seasons. In the open sea the wind currents are stronger than the tidal streams, and are accelerated or retarded by the latter, varying from three-quarters to 2 knots. In narrow channels and near the land no rule holds good, but the flood to north, and ebb to south, often prevail.

Route 1,158. Passage southward through Soenda straat, or Alas, Lombok, or Bali straten to the Indian ocean

(1) SOENDA STRAAT.—This passage has been described already in Route 1,149.

(2) ALAS STRAAT.—The description of this strait and of the tidal streams, monsoon drift, and the winds to be found therein, is given in Route 1,140 (3).

Directions.—Approaching from the northward Mount Rindjani and the high north-west part of Soembawa eiland are conspicuous. The 100-fathoms ($182^{m}9$) contour line from the southward terminates about a mile from Tanjong Ringgit; from the northward it penetrates as far as a line running westward from Belang eiland. The soundings between are deep but irregular. Alas straat, as are all straits eastward of Java, is more or less subject to calms; it is therefore advisable in a sailing vessel to keep within soundings on the Lombok eiland side, the more so as the currents are not so strong there as in the middle and on the east side.

When bound southward it is advisable to get under weigh very early in the morning, in order to clear the strait, if possible, before the sea breeze sets in.

(3) LOMBOK STRAAT.—A description of this strait and its winds and tidal streams has been given already in Route 1,140 (2). The directions for the approach and passage of the strait, bound southward, are given in Route 1,140 (2) (b) (i) and (ii).

(4) BALI STRAAT.—A description of this strait and notes on the winds and tidal streams will be found in Route 1,140 (1).

Directions, bound southward.—This strait offers a safe passage to vessels bound southward during the North-West Monsoon, and with the exception of Alas straat, east of Lombok eiland, is to be preferred to all the passages east of Java, as there is anchorage on both sides of the narrows in case they should not be passed through in a single tide. For vessels coming from the northward, the chief difficulty to contend with is the great strength of the currents. Sailing vessels should only navigate this strait by day. During the North-West Monsoon, the water in the strait is smooth, and the passage easy.

It is well to have boats ready for towing the vessel, when near the shore, in calms.

Note.—See Route 1,157 regarding the approach to Bali straat via Sapoedi straat.

Route 1,159.—*Reserved as spare.*

SECTION C. PART II.

Chapter III

ROUTES THROUGH THE RED SEA AND FROM PORTS ON THE NORTHERN SIDE OF THE INDIAN OCEAN

(i) ROUTES THROUGH THE RED SEA

Though the Red sea or Gulf of Aden are rarely visited by sailing vessels, occasions may occur when the following directions may prove useful.

Route 1,160. Southward bound through the Red sea.

General notes.

For sailing vessels, the most favourable part of the year for the outward voyage to India, through the Red sea, is from June to September, or the period of the South-West Monsoon in the Arabian sea, as northerly winds of variable strength then prevail throughout the whole length of the Red sea. *See* here the general description of the central passage through the Red sea in Route 301, and in the Red sea and Gulf of Aden Pilot. Particular attention should be paid to the description of the currents in the Red sea to be found in the latter volume; this is especially necessary for the narrower portions of the passage, and the approaches thereto.

On approaching the Straits of Bāb-al-Mandab, choice must be made between using the Large strait, or the Small strait. For ease of navigation the former is recommended, numerous accidents having occurred in the latter *(see* Route 301); at the same time consideration must be given to the fact that anchorage, in case of need, is possible in any part of the Small strait. The circumstances prevailing at the time must determine the course to be followed.

See also Note following Route 1,161 below.

Route 1,161. Northward bound through the Red sea.

General notes.

For the northward-bound voyage by the same route as southward-bound (Route 1,160), December, January and February are the best months, as the southerly winds often carry a vessel as far as the parallel of Jidda, and sometimes as far as that of Quseir (Koseir), or even, at times, to Suez itself. After losing the southerly wind, a vessel will have the northerly wind to beat against.

If as far northward as Quseir, and bound for Suez, and a strong northerly wind is encountered, a vessel in the central channel of the Red sea, or even on the western shore, ought to stand over to the Arabian coast, where she will probably fetch Mowila *(Lat. 27° 40′ N., Long. 35° 27′ E.).* Having worked up 30 miles northward of that place, she may stand over to Ras Muhammad, leaving the Arabian coast at night. As she proceeds, the northerly winds will veer to north-north-east out of the Gulf of 'Aqaba; by keeping as close a luff as possible, these will enable her to fetch Ras Muhammad.

Note.—Sailing vessels at times experience great difficulties when working against the strong winds, which, in the winter season, blowing from either end of the Red sea towards its centre, produce a short hollow sea, and, combined with the strong current that often runs with the wind, renders the progress of such vessels very slow. In working to windward in the central channel, a vessel cannot do wrong by keeping the Arabian shore on board, but should not stand close in with a light wind or heavy swell. After dark she ought only to stand towards the shore half the distance she stands out, and should never come nearer than 10 miles to the reefs at night, to guard against the possibility of mischance from the unexpected existence of a cross current.

(ii) ROUTES FROM ADEN

See Note under (i) above.

Route 1,162. Aden to Bombay

(a) April to September (South-West Monsoon).—Take as direct a route as possible. Keep in the centre, or rather towards the Arabian shore of the Gulf of Aden, to avoid the westerly current on the African coast. During the strength of the South-West Monsoon, in June, July and August, when the weather is thick and heavy, and observations very uncertain, steer direct for Khānderi island, and watch the soundings carefully.

(b) October to March (North-East Monsoon).—During this half of the year the passage from the Red sea to India or the Persian gulf is very tedious for sailing vessels, and is now seldom attempted. In former times, the passage between Aden and Bombay, when unavoidably taken at this season, frequently occupied from 60 to 90 days.

If it is necessary to make the passage, work along the coast of Arabia, taking advantage of every shift of wind. Should the west-going current be strong inshore, stand out 60 or 80 miles from the land; if the wind be light, take advantage of the tides and land winds inshore, anchoring when requisite. When off the Kuria Muria (Khorya Morya) islands, stretch over for Bombay, and as easting is made, the wind will draw to north or even westward of north.

Route 1,163. Aden to Ceylon and Bay of Bengal

(a) April to October.—Invariably pass north of Socotra to avoid the heavy cross seas to the southward of it during the South-West Monsoon, but in all seasons of the year it is desirable to avoid passing south, if Abd-al-Kuri is to be made at night, as the currents are often strong to the northward.

To Ceylon proceed direct; and onward to the Bay of Bengal, as described in Route 1,093 (a) (i) from rounding the south end of the island. *See* directions as to navigation of Bay of Bengal given at end of that route, for all seasons of the year.

(b) October to March.—Keep along the south coast of Arabia to about 52° E.; pass through the Eight or Nine Degree channel, then steer to round Ceylon, and having passed that island, make easting on parallel of 5° N. to about the middle of the Bay of Bengal, and then work northward. From long. 87° E., a vessel will probably fetch Madras. After mid-February, round Ceylon at the distance of about 50 miles, and then proceed direct. *See* directions as to navigation in the Bay of Bengal given at the end of Route 1,093.

See Caution at end of Route 1,164, respecting Minicoy island.

See Section D. Part II. Index on pages 349 and 350.

Route 1,164. Aden to Singapore

(a) April to October.—Pass north of Socotra, and thence direct round the south end of Ceylon and across the Bay of Bengal, entering Malacca strait between Great Nicobar island and Rondo. After passing the north-west end of Sumatra the South-West Monsoon will most likely fail, and it is advisable to keep on the Malayan side of the channel, where a tidal influence prevails and there are less calms. Sometimes a brisk westerly wind will be carried as far as Penang. When once the islands on the Malay coast are sighted, there will be no difficulty in getting to the southward. *See* Note regarding Bengal passage at the end of Route 402.

For squalls or " Sumatras " in Malacca strait, during this monsoon, *see* Malacca Strait Pilot.

(b) October to March.—Work along the Arabian coast as far as Ras Fartak, or just beyond it, and thence stand across the Arabian sea, passing southward of Minicoy island, and round the south end of Ceylon, and across the Bay of Bengal. Pass close to the southward of the Great Nicobar island, if the wind permit, and thence keep on the Malay side of the Malacca strait, where there are tidal streams and more favourable winds.

Note.—See Route 1,127 (2) (a) and (b) for the approach to Singapore.

CAUTION. The practice of steering to pass a few miles northward of Minicoy, especially by night, is a dangerous one, because the island is over 4 miles long in a north and south direction, the light is on the south-west side, and the current at times sets strongly to the southward.

Route 1,165. Aden to Fremantle, Cape Leeuwin, and ports in Southern Australia or New Zealand

(a) April to October.—During the South-West Monsoon, when westerly winds prevail in the Gulf of Aden, proceed direct to the south of Ceylon, as described in Route 1,164 (a). After rounding the south extreme of Ceylon steer to the south-eastward to cross the equator in about long. 95° E.; thence continue southward across the South-East Trade into the westerly winds and round Cape Leeuwin, if not bound to Fremantle.

(b) November to March.—Proceed towards Ceylon, as described in Route 1,164 (b); and thence with the North-East Monsoon across the equator in about long. 90° E. into the North-West Monsoon. Then make easting in that monsoon as far as the east end of Java; thence stand southward across the South-East Trade into the westerlies, and thence continue to Cape Leeuwin and Fremantle.

Note.—In either (a) or (b) above, if bound to ports on the southern or south-eastern side of Australia, to Tasmania, or to New Zealand, continue southward and south-eastward in the westerlies to join the appropriate part of Route 1,091 from the Cape of Good Hope.

Route 1,166. Aden to Mauritius

(a) April to October.—Pass northward of Socotra, run through the South-West Monsoon; cross the equator in about long. 72° E. or even run through the One-and-a-half-degree channel, and make southing into the South-East Trade, passing eastward of the Chagos archipelago. From thence proceed direct to Mauritius.

(b) November to March.—Work along the Arabian coast until able to weather Capo Guardafui, run through the North-East and North-West Monsoons, crossing the equator in about long. 64° E., and the parallel of 10° S. in about long. 70° E.; when in the South-East Trade steer direct for Mauritius.

Route 1,167. Aden to Cape of Good Hope

(a) April to October.—Pass northward of Socotra, run through the South-West Monsoon, cross the equator in about long. 72° E., or even run through the One-and-a-half-degree channel and then cross the equator; thence making southing into the South-East Trade wind, passing eastward of the Chagos archipelago. Run through the South-East Trade, passing southward of Mauritius and about 100 miles southward of Madagascar, and make the African coast about 200 miles southward of Durban. From thence keep in the strength of the Agulhas current until abreast of Mossel bay, and thence proceed direct round Cape Agulhas. With westerly winds after passing Algoa bay, keep within 40 or 50 miles of the shore. *(See* Navigational Note (ii) and Caution at the end of Route 1,174).

(b) November to March.—Work along the Arabian coast until able to weather Capo Guardafui, then run down the coast of Africa and through the Mozambique channel, taking advantage of the full strength of the Mozambique and Agulhas currents as before.

See Notes as to navigation of Mozambique channel under Route 1,095 (a) (i), and Route 1,174.

Route 1,168. Aden to Mombasa and adjacent ports and to Seychelles group

(a) April to October.—The route is via Seychelles islands. Having passed northward of Socotra, stand away to the south-eastward on the starboard tack and cross the equator in about long. 70° E., or as far westward as the monsoon permits.

The South-East Trade will be met with, after crossing the doldrums, in from lat. 2° to 4° S., and having picked it up, steer direct for Seychelles, if calling there, or towards Mombasa; but allowance must be made for the probability of the wind heading, and for the strong north-going current which will be entered on nearing the African coast.

(b) November to March.—Proceed as in Route 1,167 (b), but heading for the desired port when it can be reached in the South-East Trade wind.

Route 1,169.—*Reserved as spare.*

Route 1,170.—*Reserved as spare.*

(iii) ROUTES FROM PORTS ON THE WEST COAST OF INDIA, AND FROM CEYLON

Route 1,171. Karāchi to Bombay

Proceed direct, but in June, July and August first get an offing into 15 or 20 fathoms ($27^{m}4$ to $36^{m}6$) before standing to the southward; Bombay should be made on the parallel of Khānderi island, and the soundings be carefully attended to. There is considerable indraught into the Gulf of Cutch from March to September.

Route 1,172. Bombay to Karāchi

(a) May to August.—In May and early in June, on leaving Bombay, make westing so as to be able to weather Diu head by 100 miles if bound into the Gulf of Cutch, or by 200 miles if for Karāchi. During June, July and August when bound for Karāchi be careful not to make the coasts of Sind and Cutch previous to sighting Manora lighthouse, as there is a south-easterly set, and the wind is liable to lull occasionally inshore, leaving the vessel with a heavy swell and lee current.

CAUTION. In the first part of the South-West Monsoon the stream during the flood, setting into the Gulf of Cutch, is greatly accelerated.

(b) September to April.—In September and October, also in March and April, when north-westerly winds are general, work direct for Diu head, and thence along the coast. In November, December, January and February work along the coast with the land and sea breezes, making due allowance for the tides, sighting the high land of St. John, or to about the parallel of 20° N., before crossing to Diu head, as the wind hangs much to north and north-north-east across the Gulf of Cambay.

November is a calm month along the south coast of Káthiáwár, and it is frequently necessary to anchor on the flood to avoid being swept into the Gulf of Cambay.

From November to January, when fresh north-easterly winds blow outside the Gulf of Cutch, and when working into it, anchor during the ebb off Dwárka or Kachigadh (Kutchgurh), and start with the flood across the mouth of the gulf to make the Cutch coast, where the water is smoother and a vessel can work to the eastward.

Route 1,173. Bombay, or Cochin, Calicut and Malabar coast to Aden

(a) May to September (South-West Monsoon).—Seldom taken.—This passage is seldom taken; but in case of necessity is given as follows, by what is known as the " Southern Passage."

After gaining an offing from the Indian coast into 15 or 20 fathoms ($27^{\mathrm{m}}4$ or $36^{\mathrm{m}}6$) water (or even to 40 fathoms ($73^{\mathrm{m}}2$) in the first part of the South-West Monsoon, as the wind then hangs much to the southward) steer down the coast, keeping in soundings of from 40 to 50 fathoms ($73^{\mathrm{m}}2$ to $91^{\mathrm{m}}4$); this is advisable to keep clear of the Laccadives in the thick overcast rainy weather that may be expected, when observations may not be obtainable for days together. After passing these islands make as little easting as possible. The wind will be from south-west to west-south-west with hard westerly squalls; a south-south-easterly current of 20 to 30 miles a day will be experienced.

Cross the equator, and when fairly in the South-East Trade run to the westward, passing south of the Chagos archipelago and north-east of the Seychelles group; recross the equator in long. 53° or 54° E. Run through the South-West Monsoon, and make the African coast between Ras Hafun and Capo Guardafui, due consideration being given to the strong north-easterly current which will be experienced on nearing the land. Pass close round Capo Guardafui, and keep along the African coast up to Mait island, and then stand across the Gulf of Aden.

See Caution under (b) below.

(b) October to April (North-East Monsoon).—Proceed direct, but towards the end of the North-East Monsoon, in March and April, the winds are less constant in the Arabian sea than in the four preceding months, and there are calms at times. In these months, steer to pass southward of Socotra; for, early in April, the North-East Monsoon is nearly expended about this island and on the coast of Arabia, and is succeeded by light breezes from south-west and west, with frequent calms. The current also begins to set strongly to the northward about Socotra, and between it and the coast of Africa. About and from the latter end of March, therefore, it is advisable to pass about 50 miles southward of that island, in order to fetch Capo Guardafui with the south-westerly winds which may then be expected.

Leaving Bombay late in April, shape a course to pass well southward of Socotra, in order to make the coast of Africa southward of Capo Guardafui with the south-westerly wind, which will probably be met with long before that shore is approached. The land may then be made anywhere between Ras Hafun and Capo Guardafui, and the remainder of the passage be made as directed for the South-West Monsoon ((a) above). *(See* also Caution below).

Note.—In November, December, January or February, sailing vessels bound to the Red sea from Cochin, Calicut, or other ports on the southern part of the Malabar coast, may steer directly westward through the most convenient channel among the Laccadive islands. Those from Cochin should pass southward of Suheli Par, keeping in about lat. 9° 30′ N.; but vessels from Mangalore or Cannanore should pass northward of all the islands. In March and April, the prevailing winds between the Malabar and African coasts being from north to north-west, it is better to keep near the Malabar coast until northward of Mount Delly (Dilli), and to pass northward of the islands; or, if the Nine Degrees channel is adopted, vessels should pass near Kalpeni and Suheli Par islands, as the current sets southward towards the Maldive islands in these months.

When clear of the islands, in November, December, January or February, a course may be shaped to pass on the northern side of Socotra; but late in March or early in April, it is prudent to keep more to the southward, in lat. 9° or 10° N. as the wind may admit; and, in May, when the South-West Monsoon may be expected, it is advisable to keep well to the southward.

CAUTION. As many vessels have been wrecked on the coast to the southward of Capo Guardafui, the utmost caution is necessary when rounding this headland from the southward or south-eastward, during the South-West Monsoon, when the weather is stormy, accompanied by a heavy sea and strong current, and the land is generally obscured by a thick haze. During daytime a gradual change will probably be seen in the colour of the water from blue to dark green; and the water becomes smoother, and the swell alters its directions to the eastward of south, when the meridian of Ras Hafun is passed. To ensure safety, however, when the land cannot be clearly seen and recognised, especially at night, sounding alone can be relied on.

After rounding Capo Guardafui, vessels should keep the African shore aboard until Mait island is reached, when they should steer for Aden. Beating along the African shore against strong westerly and west-south-westerly winds is sometimes tedious, but a vessel should persevere, as she is more likely to get to the westward thus than in the middle of the gulf or on the Arabian shore.

Vessels should have good sails bent, for the wind frequently blows in severe gusts along the African coast.

Route 1,174. Bombay to Cape of Good Hope

(a) May to September.—Stand down the coast of India *(see* Route 1,175) and across the equator into the South-East Trades; then steer to pass southward of Mauritius, and about 100 miles southward of Madagascar, and make the African coast about 200 miles south-westward of Durban. From thence, keep in the strength of the Agulhas current until abreast of Mossel bay, and then direct round Cape Agulhas. *See* Navigational Note (ii) and Caution following (c) (ii) below.

In the early part of the monsoon, June and July, when the wind is more southerly than later on, get an offing from Bombay into about 50 fathoms ($91^{\mathrm{m}}4$) water before standing down the coast, and then keep in about 40 or 50 fathoms ($73^{\mathrm{m}}2$ or $91^{\mathrm{m}}4$) to ensure being well in-shore of the Laccadive islands.

(b) April and October.—In these months the route is as in (a), above, but somewhat to the westward of it. In April a considerable shortening can usually be effected by making a direct course from lat. 15° S., long. 70° E. to lat. 30° S., long. 40° E., where the former route is again picked up.

(c) November to March.—There are two routes for the first part of this passage, one leading eastward, and one westward, of Iles Comores (Comoro islands); the two routes rejoin in about lat. 20° S. and thence continue to the Cape of Good Hope.

(i) Eastward of Iles Comores.—Proceed direct from Bombay, westward of the Seychelles and Amirante islands, and between Madagascar and the Iles Comores, in a straight line towards the African coast abreast of Durban. In about lat. 20° S., this route will be rejoined by (ii) below. Thence keep in the strength of the Mozambique and Agulhas currents. In rounding the Cape of Good Hope if westerly winds prevail, keep on the Agulhas bank not more than 40 or 50 miles from the coast; here the sea will be smoother than elsewhere. *See* Navigational Notes (i) and (ii) and the Caution at the end of this route.

(ii) Westward of Iles Comores.—This alternative, recommended by some navigators on account of the rather better current on the African side, is to proceed direct from Bombay to pass westward of the Iles Comores, and thence southward on the African side of the Mozambique channel throughout, joining with (c) (i) at about lat. 20° S.

Navigational Notes.

(i) In the Mozambique channel.—Keep well off the land until up to Cabo Delgado, as the wind sometimes hangs to the eastward and even southward of east; from thence, stand down the coast, inside St. Lazarus bank, keeping in the strength of the Mozambique and Agulhas currents and making Cape Agulhas. A vessel will probably have to work to windward in the southern part of the Mozambique channel, the prevailing winds there being southerly.

(ii) Rounding the Cape of Good Hope (from east to west).—June, July and August are the worst months, and January and February the best months for sailing vessels proceeding westward round the Cape of Good Hope, and it should be borne in mind that there is much less sea on the Agulhas bank in depths of from 60 to 70 fathoms ($109^{m}7$ to $128^{m}0$), or less, during heavy gales, than there is near its edge and southward of it. If it is found necessary to heave-to, the port tack should be chosen, as, with the exception of south-easterly gales beginning with south-easterly winds, the shift of wind is almost invariably against the hands of a watch, and the vessel will come up to the sea.

From October to April, easterly winds prevail as far southward as the tail of the Agulhas bank, about lat. 37° S., with variable, but chiefly westerly, winds beyond.

CAUTION. Mariners should remember that off all parts of the south coast of Africa, and especially off salient points, sunken wrecks or uncharted dangers may exist close to the shore; and that it is not advisable to approach this surf-beaten shore, even in full-powered steam-vessels, within a distance of 3 or 4 miles; sailing vessels should give Cape Agulhas a berth of 7 or 8 miles.

Route 1,175. Bombay to Colombo and Bay of Bengal

(1) To COLOMBO.

(a) May to September.—At the commencement of the South-West Monsoon, when the wind hangs to the south-westward; first get a good offing into 40 or 50 fathoms ($73^{m}2$ or $91^{m}4$) off Bombay, and keep on the edge of the bank in those depths to keep clear of the Laccadives. On proceeding southward the wind will generally become more favourable veering to west and west-north-west. Between Cochin and Cape Comorin southerly currents and west-north-westerly winds prevail from mid-July to mid-October.

(b) October to May.—This is the period of the North-East Monsoon and of the land and sea breezes along the west coast of India. A summary of the weather that may be expected, and advice to sailing vessels, desirous of making full use of the land and sea breezes is given below. Considerably more detail about the two monsoons and coastal winds will be found in Chapter I. of the West Coast of India Pilot.

Notes.—Land and sea breezes.

(i) General remarks.—Owing to the mountains along the western coast of India, the strength and duration of the land winds depend much upon the configuration of the land. The North-East Monsoon makes the land breezes on the Malabar coast; and the rush of cold air from the sea to the heated land, during the hot hours of the day, deadens and reverses the monsoon, making the sea breezes.

(ii) Konkan coast.—Off the Konkan coast, the South-West Monsoon fails after the middle of September, and is followed by light variable breezes, frequent calms, cloudy weather, and occasional showers. This unsettled weather lasts for 6 or 8 weeks, with prevailing winds from the north-west; but occasionally from south-west and south. On the Kanara, Malabar and Travancore coast there are occasional off-shore squalls.

Late in October, or early in November, a breaking-up storm may take place, with a high wind suddenly coming up from the southward, and blowing hard for several hours, accompanied by thunder and lightning. After this, the North-East Monsoon sets in, with fine weather; and land and sea breezes are experienced within 10 or 20 miles of the coast, which continue until March or April.

(iii) Malabar coast.—The sea breezes of the Malabar coast are fairly established throughout October, while as yet the land winds are only occasional, light and uncertain; the former seldom fail, till they are merged in the South-West Monsoon. Thus the navigator may calculate on sea breezes for eight months of the year, but on regular land winds for only half that period.

When the land and sea breezes are regular, the sea breeze fails in the evening about sunset, and is generally followed by a calm which continues until the land wind comes off; this may be expected to commence at from 2000 to 2200 hours; at first, it comes in fluctuating gentle breezes, but soon becomes steady between north-east and east-south-east, continuing so till 0900 or 1000 hours next morning; it then begins to fail, decreasing to a calm about mid-day. About this time, or soon after, the sea breeze sets in from west-south-west, west, or north-west, and generally veers to northward in the evening, decreasing in strength.

(iv) Bombay coast.—In March and April, off the coast of the Bombay presidency, the land breezes are very light and uncertain, seldom coming off till morning, and continuing so short a time that little advantage is gained by them; it is therefore necessary to keep an offing, to be ready for the sea breeze, which may at this time, between Bombay and Cape Comorin, be termed north-west winds; they usually set in about noon at west-north-west, veering gradually to north-west and north-north-west, in the evening, from which direction they continue during the first part of the night, declining afterwards to a calm about midnight, or early in the morning. A faint land breeze sometimes follows; but more frequently light airs from northward or calms may be expected, nearly from midnight until the north-west wind sets in about noon on the following day.

In April the weather is mostly hazy, and at times cloudy over the Ghats in the evenings, with light showers.

In May the prevailing winds along the coast south of Bombay are from north-west and west, but often variable and uncertain, with cloudy threatening weather and light showers at times, accompanied by lightning from south-eastward. A gale from south-westward or southward is liable to occur in this month, and several ships have speedily run along the coast to Bombay; but it is prudent to keep well out from the land, and to be prepared for bad weather, in order to avoid being driven on a lee shore if a storm should set in from westward. When north-west winds prevail, the weather is settled and clear of clouds, though a little hazy; but it is cloudy and threatening when they blow between south-east and south-west. It sometimes happens that heavy clouds collect over the land in the evenings, producing a hard squall with rain about midnight; this has frequently been experienced between Mangalore and Hog island in May and early in June, when these land squalls blow in sudden gusts through the gaps between the mountains.

(v) *Advice to sailing vessels.*—These land and sea breezes require attention for sailing vessels to benefit by them to the full extent. During the night, with the land breeze it is prudent to keep well inshore, if the wind admit, without tacking, for there it is strong and steadier than farther out; but in the morning it is advisable to edge more out, to get an offing of 15 or 20 miles, or soundings of 26 or 30 fathoms ($47^{m}5$ or $54^{m}9$), before noon, ready for the sea breeze. In the evening it is desirable to be near the shore, before the land breeze comes off; the coast may be approached to a depth of 10 fathoms ($18^{m}3$) in most places from Bombay to Quilon, and if close in prior to the commencement of the land breeze, short tacks should be made near the shore until it comes off; when calm, its approach is frequently indicated by the noise of the surf on the beach, which is heard at a considerable distance.

During the period of change, before the South-West Monsoon has set in, the small coasting vessels run into the nearest river or place of shelter south of Bombay in the afternoon, but large vessels should have sea-room.

(2) To BAY OF BENGAL.—Proceed first as for Colombo, but so as to round the south side of Ceylon. Thence make easting to middle of Bay of Bengal from June to the middle of January; but during the other half of the year keep on the western side, to destination. (*See* Notes at the end of Route 1,093 and Route 1,184).

Route 1,176. Colombo to Bombay and West coast of India

(a) May to September.—During the height of the South-West Monsoon, do not attempt to work northwards along this coast. During this period but few of the ports are visited by sailing craft. *See* "Land and sea breezes," and "Advice to sailing vessels," at the end of Route 1,175.

(b) September and October.—The passage northwards in these months is very tedious; on the southern part of the coast a strong current sets constantly to the southward, and the wind is north-west and variable, with frequent light airs; vessels often anchor to avoid being drifted back. The weather is threatening at times, with heavy showers. The land winds commence about the beginning of October, below Calicut, but do not extend far off-shore until November.

(c) December, January and February.—The regular land and sea breezes render navigation northward near the coast easy, as the sea is remarkably smooth and the sea breeze strongest.

Where there are gaps in the mountain chain, as at Palghat, on the south of the Nilgiri hills, the land winds in December and January continue sometimes to blow for more than a day without any intervening sea breeze. This occurs, also, but in a rather less degree, off Kārwār head, where the valley of Kālinadi (Sadashivgad) river assumes a straight funnel shape eastward, towards the interior tableland. In these months a sailing passage may sometimes be made from Cape Comorin to Bombay in six to eight days, and the return voyage in four or five days. In November and early in December the sea breezes are weak, but become stronger afterwards. As February advances, the land breezes decrease in strength and duration, and are not always regular.

(d) March and April.—The land breezes will generally fail in strength and duration northward of Mount Delly (Dilli); make certain, therefore, particularly in April, of being well out in 35 or 40 fathoms ($64^{m}0$ or $73^{m}2$), about noon, so that a long stretch to the north-north-eastward or north-eastward with the north-westerly winds may be made. If near the shore early in the evening, and the wind be at north-west, make short tacks, until the breeze veers to northward, which may be expected early in the night; then stretch off north-westward or west-north-westward to be ready for the sea breeze of the following day.

When a strong north-westerly wind sets in, it is liable to continue for two or three days, or longer, rendering it impracticable to gain any ground when working near the coast. At such times keep about 60 miles or more from the land, where the winds are generally moderate and the sea smooth.

(e) May.—Late in April, or during May, keep a good offing towards the Laccadives, and when to the northward of those islands keep a greater offing still, in case of a gale coming on.

On the southern part of the coast below Mount Delly (Dilli) and meeting with north-west winds in this month, stretch off to westward of the islands, passing between Suheli Par and Minicoy or between any of the Laccadive islands, to benefit by the approaching westerly winds.

Route 1,177.—*Reserved as spare.*

Route 1,178. Colombo to Aden

(a) April to September.—The passage is hardly ever undertaken at this time of year. In case of necessity, however, the following directions should be followed:—

Stand at once across the equator into the South-East Trade, thence run westward, passing southward of the Chagos archipelago, and north-eastward of the Seychelles; recross the equator in about long. 53° or 54° E., and shape course to make the African coast at Ras Hafun; round Capo Guardafui and work along the African coast as far as Mait island, before standing across the Gulf of Aden. (*See* Route 1,173 (a)).

(b) October to March.—Pass through the Nine Degree channel, and then proceed direct for Aden. After the middle of March, pass south of Socotra, as light south-westerly and westerly breezes may then be expected near this island. (*See* Caution under Route 399).

Route 1,179. Colombo to Cape of Good Hope

Pick up Route 1,174, Bombay to Cape of Good Hope, according to time of year, at the nearest available point, passing through the Nine Degree channel from November to March (North-East Monsoon), but directly to meet the May-to-September route at about the Equator, during the South-West Monsoon. *See* Route 1,174, all sections, and Caution.

Route 1,180. Colombo to Fremantle and ports in southern and south-eastern Australia, or to New Zealand

(a) April to October.—Having rounded the south extreme of Ceylon steer to the south-eastward to cross the equator in about long. 95° E.; thence southward across the South-East Trade into the westerly winds for a direct passage to Fremantle or round Cape Leeuwin. *See* Note under Route 1,165.

(b) November to March.—Make as much easting as possible in the North-West Monsoon, and then proceed southward across the trades as in (a) above.

Route 1,181. Colombo to Bay of Bengal and Malacca strait and Singapore

(1) To Bay of Bengal.—Pick up Route 1,093 from Cape of Good Hope to Bay of Bengal at the nearest available point, according to the time of year. *See* Route 1,093 (all sections) and 1,184 (Notes).

(2) To Malacca strait and Singapore.

(a) South-West Monsoon.—Having rounded the south coast of Ceylon, proceed direct to make and pass through Bengal passage to Malacca strait and thence to Singapore.

(b) North-East Monsoon.—Stand southward to about lat. 3° N., and then work to the north-eastward towards Wé, picking up Route 1,093, Cape of Good Hope to Bay of Bengal, at this time of year in about long. 93° E. Pass through Bengal passage to Malacca strait and Singapore.

Note.—For directions through Malacca strait *see* Malacca Strait Pilot; for making Singapore from the westward, *see* Route 1,127 (2) (a) and (b).

Route 1,182.—*Reserved as spare.*

(iv) ROUTES FROM PORTS IN BAY OF BENGAL

(except from Rangoon southward).

Route 1,183. Madras to Calcutta

See Caution under Route 1,189 and Notes under Route 1,184.

(a) April to August.—Proceed as directly as possible, making the land about Pundi (*Lat. 18° 41′ N., Long. 84° 28′ E.*). Sounding should not be neglected.

(b) September and October.—Stretch over to North Andaman island or Cape Negrais; when 100 miles westward of either, tack to the north-west.

(c) November to January.—Make easting across the bay, and then northing on the east side or in the middle.

(d) February and March.—Steer direct, if possible; otherwise stand to the eastward across the bay as in (*c*).

See Notes under Routes 1,093 and 1,184.

Route 1,184. Madras to Rangoon, Moulmein or Mergui

See Caution under Route 1,189.

(a) South-West Monsoon.—Sight Landfall island of the Andaman islands if with southerly wind, or Great Coco island with westerly wind. Pass through Coco channel, and thence eastward, sighting Narcondam island; then make China Bakir light-vessel, if bound for Rangoon, or Double island if bound for Moulmein. If bound for Mergui, pass southward of Little Andaman island, and thence steer for Tenasserim island.

(b) North-East Monsoon. — Make northing in middle of bay, pass through Preparis North or Preparis South channel, and then steer to make China Bakir light-vessel if for Rangoon, or Double island if for Moulmein, sounding continuously and allowing for tidal streams. If bound for Mergui, pass northward of the Andaman islands, and thence work to the eastward and pass Tavoy island on either side.

See Notes under Route 1,093.

Note.—General Navigation in Bay of Bengal.—There is no difficulty in proceeding from southern to northern ports in the Bay of Bengal during the South-West Monsoon, nor from northern to southern ports during the North-East Monsoon. Vessels bound from a port on the eastern side to a port on the western easily make the passage during the North-East Monsoon; so also do vessels from a western to an eastern port during the South-West Monsoon.

When the monsoon is contrary, a sailing vessel must work up or down, as the case may be; or after standing some distance across the bay shape course direct. At the change of the monsoon, voyages are usually tedious, for the light and variable winds, then prevalent, are as often adverse as favourable, every slant should be taken advantage of, and the north-eastern part of the bay avoided, unless bound to, or from, one of the ports on that side of the bay.

General directions for vessels bound southward.

January 15th to May 31st.—Take the eastern side of the Bay.

June, July and August.—Keep in the middle of the Bay; or take the eastern side and pass eastward of the Andaman islands.

September, October and November.—Take the western side of the Bay.

December to January 15th.—Keep in the middle of the Bay.

See also Route 1,093 for vessels bound northward.

Route 1,185. Bay of Bengal to Bombay

See Caution under Route 1,189 *and Note under Route* 1,184.

(a) South-West Monsoon (seldom undertaken).—Stand first southward across the equator into South-East Trade, run westward between lat. 8° and 9° S., passing south of the Chagos archipelago. From long. 70° E., steer to cross the equator in long. 62° or 63° E. and thence direct.

(b) North-East Monsoon.—Stand down the west side of the bay and at convenient distance from coast of Ceylon. After passing Cape Comorin keep in sight of the west coast of India, so as to profit by the sea breezes.

See Route 1,175 (Notes on land and sea breezes) and all sections of Route 1,176, Colombo to Bombay and west coast of India.

Route 1,186. Bay of Bengal to Aden

See Caution under Route 1,189.

(a) South-West Monsoon (seldom undertaken).—Run southward across the equator into South-East Trades. Then run westward, passing southward of the Chagos archipelago and north-eastward of the Seychelles; cross the equator in about long. 53° or 54 E., and make the African coast at Ras Hafun; great caution is necessary in making the land. Round Capo Guardafui and work along the African coast as far as Mait island before standing across for Aden.

See Route 1,173 (a) and Note under Route 1,184.

(b) North-East Monsoon.—Pass round Ceylon and through the Nine Degree channel; thence steer to pass northward of Socotra. After the middle of March keep southward of Socotra.

See Route 1,173 (b) and Note under Route 1,184.

Route 1,187. Bay of Bengal to Cape of Good Hope

See Caution under Route 1,189 *and Note under Route* 1,184.

(a) May to September.—From the Sandheads make for the Orissa coast, sighting the land south of False point (*Lat. 20° 20′ N., Long. 86° 44′ E.*) and working to the south-westward along the shore; make short tacks during the day and long boards off-shore during the night, bringing Kalingapatam (*Lat. 18° 19′ N.,*

Long. 84° 08′ E.) abeam before leaving the coast and standing down the bay. A comparatively smooth sea and a favourable current will be found near the shore, and advantage may be taken of a veering wind in the squalls off the land.

When standing down the Bay of Bengal in the South-West Monsoon, keep well westward of the Andaman islands, in order not to be on a lee shore should a strong westerly gale set in; or, which is better, pass through Preparis North or Preparis South channel, and then work southward in the comparatively smooth water eastward (or to leeward) of the Andaman and Nicobar islands.

Note.—Fast sailing vessels from Calcutta, in the South-West Monsoon, do beat down the Bay of Bengal, reaching about 100 miles westward of the Andaman islands; but the wear and tear is great, and the saving in time slight.

From Madras or the Coromandel coast, stand at once across the Equator into the South-East Trade.

In either of the above cases, and from all parts of the Bay, stand southward so as to cross the Equator in about long. 95° E., keeping on the tack which makes most southing into the South-East Trade.

Cross the meridian of 90° E. at lat. 10° S., and from this point, steer a direct course for Cape Agulhas, passing about 200 miles southward of Rodriguez island, and the same distance southward of Madagascar. Make the African coast in about lat. 33° S., and keep in the strength of the Agulhas current to abreast of Mossel bay, and then direct round Cape Agulhas. *See* Route 1,174, Navigational Note (ii), and Caution.

(b) November to March.—Run straight down the bay, cross the equator in long. 86° to 87° E., and pick up the May to September route at about lat. 15° S., and run thence direct to Cape Agulhas, as described in (a) above.

(c) October and April.—During these months, run down the bay on a line just eastward of the 90th meridian; cross the equator at long. 90° E., and pick up the May-to-September route at lat. 15° S., continuing to destination thence, as described in (a), above.

Route 1,188. Bay of Bengal to Fremantle, Cape Leeuwin and ports in southern and south-eastern Australia, and to New Zealand

See Caution under Route 1,189, *and Note under Route* 1,184.

(a) March to October.—Having worked along the west shore of the Bay of Bengal (*see* Route 1,187 (a)) far enough to weather the Nicobar islands and the islands fronting the south-west coast of Sumatra, stand out of the Bay of Bengal on the starboard tack, cross the South-East Monsoon and South-East Trade; and having got into the prevailing westerly winds to the southward, proceed eastward for Cape Leeuwin and Fremantle. The doldrum belt will be found to extend to about lat. 4° S.

(b) November to April.—Stand down the middle of the Bay of Bengal, and across the equator into the North-West Monsoon. Thence make easting in the North-West Monsoon as far as Christmas island; then stand southward across the South-East Trade into the westerlies, and so to Cape Leeuwin and Fremantle.

See Note at the end of Route 1,165 for continuation eastward of Cape Leeuwin.

Route 1,189. Calcutta to Madras or Ceylon

See Note under Route 1,184.

(a) South-West Monsoon.—Make southing without closing the east side of the bay. Steer for port when 60 miles southward of it.

If unable to work southward, pass eastward of the Andamans and Nicobars and through Bengal passage. Thence work across the bay; but in June, July and August, stand across the equator into South-East Trade, make westing, and recross the equator in about long. 83° E., if bound for Madras; then proceed direct. Bound for Colombo recross the equator in about long. 77° E.

(b) North-East Monsoon.—Steer direct. In September, with light south winds, work to south-west, keeping in soundings, or stand out to sea. Give the coast a berth in February and March as the current then runs northward.

CAUTION. *Cyclones.*—When leaving the Hooghly from June to September notice of the approach of a cyclonic storm, or of the existence of a storm in the northern part of the bay, is given by easterly winds and a falling barometer, or by the storm signals at several prominent positions (*See* Bay of Bengal Pilot). In July or August the storm will probably be of moderate force, although not invariably so, but in June and September some most violent cyclones have visited the coasts of Bengal and Orissa. As a vessel standing southward would most likely run into the storm, the river should not be left until the weather has moderated.

In May, October or November a squally easterly or north-easterly wind driving low, long-drawn masses of cloud before it, or a strong westerly current at the head of the Bay of Bengal, indicate that a cyclonic storm is in the northern part of the bay, and a vessel should not proceed southward until finer weather prevails. But in these months a cyclonic storm may be far down the bay, and at the Hooghly river, or other port at the head of the bay, there may be every appearance of fine weather. With these conditions, on the first indications of the coming storm the changes of the wind and barometer should be carefully watched, and the course of the storm, if possible determined.

If in the right-hand semicircle the vessel should be hove-to on the starboard tack until the storm has passed, and if undoubtedly in the left-hand semicircle should heave-to on the port tack if the wind is eastward of North, or run southward, keeping the wind on the starboard quarter, when the wind is North, or westward of North.

Vessels lying in the roadsteads of the Coromandel coast on the approach of a cyclonic storm usually run southward round the south-western quadrant, and this is probably the only course open to sailing vessels.

See also Note (b) in Route 1,093.

Route 1,190. Calcutta to Rangoon, Moulmein, or Mergui

See Caution under Route 1,189, *and* 1,093, *and "General navigational note" under Route* 1,184.

(a) South-West Monsoon.—Steer to pass through Preparis South channel, and thence to make China Bakir light-vessel, if bound for Rangoon; but make Double island if bound for Moulmein, allowing for tidal streams. If bound for Mergui, pass on either side of the Coco islands.

(b) North-East Monsoon.—Steer to pass round Alguada reef and then work eastward, sounding frequently and making full allowance for tidal streams.

Route 1,191. Calcutta to Singapore

See Caution under Routes 1,189 *and* 1,093, *and "General navigational note"* under Route 1,184.

(a) South-West Monsoon.—Proceed direct through Preparis South channel and Malacca strait.

(b) North-East Monsoon.—Proceed through Preparis North, or Preparis South, channel, and thence direct through Malacca strait.

See Route 1,127 (2) (a) and (b) for directions for Singapore strait.

Routes 1,192 to 1,195.—*Reserved as spare.*

For Routes from Rangoon, Moulmein, or Mergui, see Chapter IV.

SECTION C. PART II.

Chapter IV

ROUTES FROM PORTS ON THE EASTERN SIDE OF THE INDIAN OCEAN

(i) ROUTES FROM PORTS IN BURMA

Route 1,196. Rangoon or Moulmein to Calcutta

See Note at the end of Route 1,184 and Cautions under Routes 1,093 and 1,189.

(a) South-West Monsoon.—Pass through Preparis North or South channel and then proceed as directly as possible.

(b) North-East Monsoon.—Round Alguada reef, and thence proceed northward about 30 miles off the Burma coast before stretching across; but after January, from Alguada reef stand first into the middle of the Bay of Bengal before working northward.

CAUTION. Vessels leaving Rangoon or Moulmein, and encountering strong north-easterly winds, with a falling barometer, denoting the existence of a cyclonic storm eastward of the Andaman islands, should delay their departure until the storm has passed. This is indicated by a rising barometer, and the wind shifting to east or southward of east. *See* also Caution under Route 1,189.

Route 1,197. Rangoon or Moulmein to Madras

See Note at the end of Route 1,184 and Cautions under Routes 1,093, 1,189 and 1,196.

(a) South-West Monsoon.—Keep well out to sea if the wind becomes westerly and endeavour to sight Narcondam island.

In working south, keep west of and at a moderate distance from the Mergui archipelago. Pass through Bengal passage and thence work westward to destination.

(b) North-East Monsoon.—Pass through Preparis North channel and thence proceed as directly as possible. After January however, make the land southward of destination.

Route 1,198. Rangoon or Moulmein to Malacca strait and Singapore

See Note under Route 1,184 and Caution under Route 1,196.

(a) South-West Monsoon.—Proceed as in Route 1,197 (a), passing the south point of Goh Puket or Salang island; thence proceed direct through Malacca strait.

(b) North-East Monsoon.—Keep outside the Mergui archipelago, sight the south point of Goh Puket or Salang island and proceed thence direct through Malacca strait.

Note.—The passage through Singapore strait to Singapore will be found in Route 1,127 (2) (a) and (b).

Route 1,199. Rangoon or Moulmein to Cape of Good Hope

In both monsoons, stand southward to the eastward of the Andaman and Nicobar islands, and pick up Route 1,187 (a), the May to September route from the Bay of Bengal, at lat. 15° S., continuing to destination thence, as described in that route.

Route 1,200. Mergui to Calcutta or Madras

See Navigational Note under Route 1,184, and Cautions under Routes 1,189 and 1,196.

(1) To CALCUTTA.

(a) South-West Monsoon.—Work to the westward and pass through Coco or Preparis channels.

(b) North-East Monsoon.—Pass through any channel north of the Andaman islands and then proceed direct.

(2) To MADRAS.

(a) South-West Monsoon.—When clear of the islands, work southward to the north end of Sumatra; pass through Bengal passage and thence proceed direct to Madras.

(b) North-East Monsoon.—Proceed as in (1) (b) above, but after January, steer to pass southward of Little Andaman island.

Route 1,201.—*Reserved as spare.*

Route 1,202.—*Reserved as spare.*

(ii) ROUTES SOUTHWARD OR WESTWARD, FROM SINGAPORE OR EASTERN ARCHIPELAGO

Route 1,203. Singapore to Colombo or Madras

See Notes on Bengal passage under Route 402.

(1) To MADRAS.

(a) South-West Monsoon.—Keep along the north coast of Sumatra, pass through Bengal passage and work across the Bay of Bengal; but in the height of the South-West Monsoon (in June, July and August), from a good berth off Ujong Masam Moeka (Muka) or Achin head cross the equator, and make westing in the South-East Trade, and recross the equator in about long. 83° E.

(b) North-East Monsoon.—Keep on the Malay coast until Goh Puket or Salang island is reached; thence pass through either Ten-Degree, or Sombrero channel (Nicobars). In December and January make the land northward of port on account of the southerly set on the Coromandel and Ceylon coasts.

(2) To COLOMBO.

(a) South-West Monsoon.—Keep along the north coast of Sumatra and pass through Bengal passage; from a good berth off Ujong Masam Moeka or Achin head, cross the equator and make westing in the South-East Trade. Recross the equator in long. 77° E., and proceed as directly as possible to Colombo.

(b) North-East Monsoon.—Pass on either side of Pulau Perak and between Pulau Rondo and Great Nicobar island; thence proceed direct, but if westerly winds are experienced near the northern end of Sumatra, which is probable in October and November, keep to the northward before altering course.

Route 1,204. Singapore to Calcutta

See Navigational Note under Route 1,184.

(a) South-West Monsoon.—Pass to the southward of the Nicobars, and thence steer direct for the Orissa coast.

(b) North-East Monsoon.—Up to mid-January pass east of the Andaman islands. After mid-January pass south of the Andamans, or through Duncan passage *(See Bay of Bengal Pilot)*, and work to the northward in the middle of the Bay of Bengal, as north-westerly and westerly winds are then found north of the Andamans.

See Section D. Part II. Index on pages 349 and 350.

Route 1,205. Singapore to Rangoon or Moulmein

See Navigational Note under Route 1,184.

(a) South-West Monsoon. — Sight Narcondam island, and thence make China Bakir light-vessel, if bound for Rangoon, or Double island, if bound for Moulmein.

(b) North-East Monsoon.—Sight Great Western Torres island, and thence make China Bakir light-vessel, if bound for Rangoon, or Double island, if bound for Moulmein.

Route 1,206. Singapore to Northern Australia

(1) To Port Darwin.

(a) April to October.—In the South-West Monsoon in the China sea, and the easterly monsoon on north coast of Australia, when bound from Singapore to Port Darwin, proceed through Balabac strait across Sulu sea, through Basilan strait and Straat Bangka, and thence through Straat Manipa for Port Darwin.

See Chapter II. of Section C., Part II. for directions on this route. *See also* Route 1,302, Singapore to the Sulu sea and the relevant part of Route 1,316 for the passage thence to Port Darwin.

(b) November to April.—In the North-East Monsoon in China sea, proceed through Soenda straat (Sunda strait), and thence for Port Darwin with the North-West Monsoon. Or through Karimata and Sapoedi straten and into the Indian ocean by Lombok or Alas straten.

See Chapter II. as in (a).

(2) To Thursday island.

(a) April to October.—Follow (1) (a) above as far as the Ceram sea to join Route 1,316 (1) (a), noting the alternative route under that route. *See* Chapter II. of Section C., Part II. for the passage through the Eastern archipelago.

(b) November to April.—Proceed via Karimata straat (*see* Chapter II. of Section C., Part II. and Route 1,300), and thence either

(i) Via Lombok or Alas straten and the Arafura sea, or

(ii) Via the Java and Flores seas to join (2) (a) above at a convenient point.

Route 1,207. Singapore to Fremantle or Southern Australia

(a) April to October.—Leaving Singapore for Fremantle, between April and October, proceed southward through Banka straat and Soenda (Sunda) straat, and thence across the South-East Trade until in the region of westerly winds, whence a course may be shaped for Fremantle or Cape Leeuwin.

See Chapter II. of Section C., Part II. for the passage through the Eastern archipelago, and Route 1,091 for continuation of the passage from Cape Leeuwin.

(b) November to April.—In the North-East Monsoon, if bound to any of the western or southern ports of Australia proceed through Straat Banka, north of Java, and through Bali or Lombok straten, and thence steer to the southward into the South-East Trade. Keep the ship close hauled on the port tack in the trade wind and on losing the trade steer to the south and south-east into the westerly winds, whence proceed as directed in Route 1,091, Cape of Good Hope to Australia.

See also Chapter II. of Section C., Part II. for the passage through the Eastern archipelago.

Route 1,208. Singapore or Soenda (Sunda) straat to Cape of Good Hope

First proceed to Soenda straat by one of the routes described in Chapter II. of Section C., Part II., and thence as follows:—

(a) April to September.—Having passed through Soenda straat and got well clear of the land, steer directly for a position 200 miles southward of Rodriguez island, in about lat. 23° S., long. 63° E.; thence pass about 200 miles southward of Madagascar and proceed as described in Route 1,110 (2), Mauritius to Cape Town.

See Navigational Note (ii) and Caution under Route 1,174.

(b) October to April.—Having cleared Soenda straat, stand to the southward into the South-East Trade wind, crossing the meridian of 90° E. in about lat, 16° S.; thence steer to join (a) above about 200 miles southward of Rodriguez island.

CAUTION. This period is the cyclone season of the South Indian ocean.

Route 1,209. Singapore or Soenda straat to Aden

The passage may be started either by passing through Malacca strait and northward of Sumatra or through Soenda straat.

(a) Via Malacca strait.

(i) April to September.—Follow Route 1,203 (2) (a) into the South-East Trade and then make westing to pass southward of the Chagos archipelago, there joining Route 1,178 (a) Colombo to Aden.

(ii) October to March.—Follow Route 1,203 (2) (b) round the south of Ceylon and make for the Nine Degree channel to join Route 1,178 (b) Colombo to Aden.

(b) Via Soenda straat.

First take one of the routes to Soenda straat described in Chapter II. of Section C., Part II., and thence as follows:—

(i) April to September.—Make as directly as possible to pass southward of the Chagos archipelago to join Route 1,178 (a), Colombo to Aden.

(ii) October to March.—Make as directly as possible for the Nine Degree channel to join Route 1,178 (b)

Route 1,210. Soenda (Sunda) straat northward along the Western coast of Sumatra

General remarks.

The routes along the west coast of Sumatra may be considered as three in number, but the Outer route only (in the open sea) may be said to be free from danger, as the coast is only partially surveyed. Vessels should keep the sea until abreast the desired port before hauling in.

For a sailing vessel, the voyage in either direction and at all seasons is long and wearisome on account of frequent calms, but it is generally more difficult to work northward than southward, owing to the prevalence of south-easterly currents, which may be looked for even with and after a southerly wind. January and February are the best months for going northward, while in September, October and November vessels will often be compelled to keep far out to sea in order to make even a little northing; working in-shore during these months is almost impracticable.

Outer route.—The route to the westward of all the islands, in the open sea, is the best of the three, more especially for sailing vessels and others not intending to touch at any of the west coast ports. South-west and southerly winds often prevail here, when north-west squalls, variable baffling winds, calms and southerly currents, may be experienced close to the land. A quicker voyage to the northward will thus be made during either monsoon. If touching at any of the ports, they may be steered for when on their parallel.

Middle route.—The middle route is the space between the chain of large islands, in the offing, and those small islands adjacent to, and interspersed along, the coast, and ranges from 10 to 30 miles distance from the coast of Sumatra.

It should not be followed by a sailing vessel when bound to the northward, nor at any time, if it can be avoided without inconvenience. Although it is wide, and may be adopted by night or day in vessels of light draught when the weather is clear and favourable, vessels are more at the mercy of the currents when the winds are light and baffling, and there is no anchorage; in some parts there are dangerous coral shoals, of the approach to which sounding will give no warning.

Inner route.—The inner route is that close along the coast, and between some of the islands and dangers off it. It, like the Middle route, should seldom be chosen by sailing vessels bound to the northward in either monsoon; but as there are, in many places, moderate depths for anchoring, it is preferable in that respect to the Middle route. Vessels visiting many of the ports are obliged to use it, but considerable risk is run when taking this route at night; those using it are generally obliged to anchor at sunset.

Pilots.—Experience has shown that little confidence should be placed in the natives who offer themselves as pilots on the west coast of Sumatra for ports seldom visited. *See* Malacca Strait Pilot.

Route 1,211. From Bali straat, Lombok straat, Alas straat or Ombai straat to Cape of Good Hope

(1) From BALI STRAAT, LOMBOK STRAAT OR ALAS STRAAT.—Stand to the south-west, during the easterly monsoon, or direct to the southward during the westerly monsoon, to pick up the South-East Trade wind at the nearest point, then make to cross the meridian of 90° E., at lat. 22° to 23° S. From this point stand westward along the parallel to join Route 1,208, Singapore to Cape of Good Hope, in about lat. 23° S., long. 63° E.

(2) From OMBAI STRAAT.—Pass through the Sawoe (Savu) sea and into the Indian ocean between Timor and Soemba (Sumba) islands. Thence steer to join (1) above at the most convenient point, having regard to the wind prevailing at the time.

Route 1,212.—*Reserved as spare.*

(iii) ROUTES FROM PORTS IN NORTHERN AUSTRALIA

(TO INDIAN OCEAN, CHINA SEA AND SYDNEY. *See* ALSO FROM THURSDAY ISLAND).

Route 1,213. Northern Australia to Sydney

Although part of this route lies in the Pacific ocean, it is included here as the passage is made east-about, or west-about, according to the monsoon season. *See* also Route 1,287, Thursday island to Sydney.

(a) April to October.—In the South-East Monsoon, after having stood westward and made North-west cape endeavour to take advantage of the north-west winds (which occur at that season) to make southing. Having rounded Cape Leeuwin, proceed via Bass strait for Sydney. *See* Route 1,091 (1) (c) and 1,091 (5) (b).

(b) November to April.—In the North-West Monsoon period, proceed through Torres strait, and stand out in the Pacific until sufficient easting has been made to enable the port to be reached with the South-East Trade. *See* Route 1,287, Thursday island to Sydney.

Route 1,214. Northern Australia to Fremantle

(a) April to October.—During the South-East Monsoon, having made North-west cape, take advantage of the north-west winds which prevail at that season, and the parallel of Rottnest island will be quickly reached.

(b) November to April.—During the North-West Monsoon period, to make a quicker passage to the southward make short boards along the coast, taking advantage of the land breezes, instead of standing to the south-westward on a long board.

Note.—Only during the strength of the North-West Monsoon should a sailing vessel proceed east-about via Torres and Bass straits, and round Cape Leeuwin.

Route 1,215. Northern Australia to Cape of Good Hope

(a) April to October (South-East Monsoon).—Shape course through the Arafura sea to join Route 1,211 (1) or (2).

Note.—Owing to the possibility of the existence of more shoals and dangers than those already shown on the charts in the Arafura sea, especially between the south and east coasts of Timor and the north coast of Australia, a vessel may well take the route north of Timor as described in Route 447 (c). From Ombai straat proceed as given in Route 1,211 (2).

(b) November to April (North-West Monsoon).—During the strength of the North-West Monsoon proceed via Torres strait and Bass strait. *See* Route 1,287, Thursday island to Sydney, and Route 1,235 (b) Sydney to Cape of Good Hope.

Route 1,216. Northern Australia to Colombo

(a) April to October.—Proceed westward with the monsoon, crossing the equator in about the meridian of 75° E., and thence steer as directly as possible to Colombo in the South-West Monsoon. *See* Note under Route 1,215 (a).

(b) November to April.—Make to the northward through the Moluccas and Manipa straat, and round the north of Celebes, through Basilan strait into the Sulu sea; cross it and pass into the China sea through the Balabac passage, and thence to Singapore. Thence proceed through Malacca strait, and southward of Great Nicobar island to destination, in the North-East Monsoon *(See Route* 1,203 (b)).

For a description of the passages through the Eastern archipelago and the approach to Singapore, *see* Chapter II. and Index on pages 247 to 251.

Route 1,217. Northern Australia to Calcutta

(a) April to October.—During the South-East Monsoon on the north coast of Australia and South-West Monsoon in Bay of Bengal, proceed as in Route 1,216 (a) for Colombo, but crossing the equator in about long. 82° E.; thence steer eastward of Ceylon for the mouth of Hooghly river.

Sufficient westing should be made in the South-East Monsoon before proceeding northward to enter the limits of the South-West Monsoon of the Indian seas.

(b) November to April (North-West Monsoon).—Take Route 1,216 (b) to Singapore, and thence Route 1,204 (b) to Calcutta.

Route 1,218. Northern Australia to Singapore

(a) April to October.—Two routes are available one northward of Timor and through the Java sea, the other southward of all the islands and through Soenda straat.

(i) Usual track.—Steer to pass northward of Timor *(see* Route 447 (c)), through Wétar straat and Wétar passage into the Flores sea; continue westward along the north side of all the islands and, having passed through Sapoedi straat, make for Banka straat and thence to Singapore. *See* Routes and Index in Chapter II. on pages 247 to 251.

(ii) Alternative route.—Pass north or south of Timor and keep along the southern side of all the islands, entering the Java sea through Soenda straat. Thence proceed as detailed in Chapter II. *(See* Index on pages 247 to 251.

(b) November to April.—Take Route 1,216 (b).

See Section D. Part II. Index on pages 349 and 350.

Route 1,219. Northern Australia to Hong Kong

(a) April to October.—Proceed as in Route 1,218 (a) above but pass through Gaspar straten or Karimata straat and thence between the Anamba and Natuna islands into the China sea; thence steer between the Paracel islands and the Macclesfield bank to Hong Kong.

Note.—In thick weather proceed through Banka straat instead of Karimata or Gaspar straten.

(b) November to April.

(i) Via Bougainville strait.—During the North-West Monsoon on coast of Australia and North-East Monsoon in China, if bound from Northern Australia to Hong Kong proceed eastward through Torres strait, thence eastward of Treasury island, through Bougainville strait and northward of Philippine islands for Hong Kong.

(ii) Via "The Second Eastern passage."—This route can be taken if preferred. *See* Chapter II. and Index on pages 247 to 251.

Route 1,220.—*Reserved as spare.*

(iv) ROUTES FROM SOUTH-WEST AND SOUTH AUSTRALIA

Route 1,221. Fremantle to Mauritius and to the Cape of Good Hope

There are two routes to the Cape of Good Hope, Northern and Southern; of which the Northern is available all the year round, and the Southern only during the summer months, December to March, and is rather more direct.

(1) To MAURITIUS (*All seasons*).—From Fremantle steer north-westward into the strength of the South-East Trade wind, which is generally found between the parallels of 15° and 20° S., and where the equatorial current sets to the westward. Having reached the parallel of 20° S., and long. 90° E., in summer, and two or three degrees nearer the equator in the southern winter, continue westward for Mauritius, passing about 50 miles southward of Rodriguez; though from November until April it is advisable to keep at a greater distance, as cyclones sometimes occur at this season, not only in this locality, but also in the space between these islands and the north-west coast of Australia. After passing Rodriguez steer as directly as possible for Mauritius.

(2) To THE CAPE OF GOOD HOPE.

(a) Northern route.—Proceed as for Mauritius in (1) above, but pass 100 to 200 miles southward of Rodriguez island, and thence about the same distance southward of Madagascar, to join Route 1,174 (a). *See* Navigational Note (ii) and Caution under Route 1,174 and Note under Route 1,110 (2).

(b) Southern route (December to March).—From Fremantle, steer to cross the meridian of 100° E., at lat. 30° S., and thenceforward make a nearly westerly course across the ocean to the meridian of 40° E., keeping between the parallels of 27° S. and 29° S.; being farthest to the southward in December, and to the northward in March. From the meridian of 40° E., steer towards the African coast to join Route 1,174 (a) eastward of Algoa bay. *See* Navigational Note (ii) and Caution under Route 1,174 and Note under Route 1,110 (2).

Route 1,222. Fremantle to Aden

(a) April to October.—Proceed direct to pass southward of the Chagos archipelago to join Route 1,173 (a). *See* also Caution at the end of Route 1,173.

(b) November to April.—Take the steamship route. *See* Route 457 (b) (i).

CAUTION.—*See* the remarks in Route 1,173 (b) regarding passing Socotra, and Caution under Route 399 (c) and Notes at the end of that route.

Route 1,223. Fremantle to Colombo

(a) April to October.—With the South-East Trade in South Indian ocean and South-West Monsoon north of equator, cross the equator in long. 80° E., and thence proceed northward to Colombo.

(b) November to April.—During North-West Monsoon in the South Indian ocean and North-East Monsoon in the Bay of Bengal, steer across the South-East Trade to enter the North-West Monsoon in about lat. 10° S., long. 90° E. Thence continue northward with the North-West Monsoon across the equator in about long. 87° E., and with the North-East Monsoon to Colombo.

Route 1,224. Fremantle to Calcutta

(a) April to October.—With the South-East Trade in the South Indian ocean, and South-West Monsoon in the Bay of Bengal, proceed direct for the east coast of Ceylon, and thence for the Hooghly river. *See* Note below.

(b) November to April.—During the North-West Monsoon in the South Indian ocean, proceed direct to the equator, crossing it in about long. 93° E.; and thence to make the land about Ujong Masam Moeka (Achin head) (north-western point of Sumatra). From Ujong Masam Moeka steer to pass to the westward of the Nicobar islands, and thence up the Bay of Bengal, close-hauled, to the westward of all the islands.

If the equator is crossed as late as March, keep well to the westward in passing up the Bay of Bengal, as the current at that time runs northward along the west coast of the Bay, and the winds will be found between south-west and south-east. In the middle of the bay they are light and variable from north-west to north-east.

Note.—*See* General Notes and Caution at the end of Route 1,093, and Notes at the end of Route 1,184.

Route 1,225. Fremantle to Singapore or Hong Kong

(1) To SINGAPORE.

(a) April to October.—Steer on a direct course for Soenda straat, taking care to make the land to the eastward of the strait as the west-going current is often strong near the south coast of Java.

Proceed from this point as indicated in the Index to Chapter II. on pages 247 to 251, and *see* remarks in Route 1,092 (1) (a) and (2) (a).

(b) November to April.

(i) Direct route.—Steer to cross lat. 12° S. in long. 102° E., and then pass about midway between Christmas and Cocos islands, there joining Route 1,092 (1) (b) to Singapore via Soenda straat. Proceed from Soenda straat to Singapore or China as indicated in the Index to Chapter II. on page 248.

(ii) Alternative route.—Cross lat. 20° S., in about long. 110° E., and then follow Route 1,092 (2) (b) (i) and (ii) as far as Manipa straat. From this point pass through Molucca sea, Bangka straat, Celebes sea, Basilan strait, Sulu sea and Balabac strait into the China sea. Thence proceed to Singapore in the North-East Monsoon. *See* Index to Chapter II. on pages 247 to 251.

This alternative route, although longer, will probably give a better passage.

(2) To HONG KONG.

(a) April to October.—Proceed to Soenda straat as in (1) (a) above and thence to the China sea as given in the Index to Chapter II. on page 248.

(b) November to April.

(i) Via Ombai straat.—Take (1) (b) (ii) above as far as Ombai straat and proceed by the "Second Eastern passage." *See* the Index to Chapter II. on page 249.

(ii) Via Soenda straat.—Take (1) (b) (i) to Soenda straat and then continue on that route to Singapore, and thence eastward through Palawan passage and along the coast of Luzon until able to stand across to Hong Kong. *See* Index to Chapter II. on page 248.

Note.—A vessel having passed through Soenda straat finds the North-West Monsoon in those waters and the North-East Monsoon in the China sea have already begun, are advised to make to the eastward to pick up the "Second Eastern passage." *See* (2) (b) (i) above, and Route 1,133. This route is available only from November to February. *See* Index as above.

Route 1,226. Fremantle to ports in South-eastern Australia, or to New Zealand

Stand southward to join the appropriate section of Route 1,091 from the Cape of Good Hope.

Route 1,227.—*Reserved as spare.*

Route 1,228. Adelaide, Melbourne or Hobart to the Cape of Good Hope

There are two routes according to season, northern or southern.

(a) Northern route.—April to October.—At this time of the year, when the South-East Monsoon of the Arafura sea connects on the one hand with the South-East Trade of the Pacific ocean, and on the other with the South-East Trade of the Indian ocean, proceed first to the northward up the eastern coast of Australia, preferably by the Outer Route *(see* Route 1,235), and from thence through the Arafura sea into the Indian ocean and to the Cape of Good Hope by Route 1,215.

Note.—Directions for the passage through Bass strait are given in Route 1,256.

(b) Southern route.—December to April.—Easterly winds being prevalent on the southern coasts of Australia from December to April, vessels then take the southern route from all ports mentioned.

First proceed as directly as possible to round Cape Leeuwin at a safe distance, having regard to the weather prevailing at the time and the danger of being caught on a lee shore. From Cape Leeuwin stand to the north-westward into the South-East Trades and join Route 1,221 (2) (a) or (b).

Route 1,229. Adelaide, Melbourne or Hobart to Aden

(a) April to October.—Proceed as in Route 1,228 (a) to Torres strait, and thence through the Arafura sea *(see* Note under Route 1,215 (a)). Having cleared all dangers in the Arafura sea, steer to pass southward of the Chagos archipelago to join Route 1,173 (a).

(b) November to April.—Pass round Cape Leeuwin as in Route 1,228 (b) above, and then steer north-westward to join Route 1,222 (b), Fremantle to Aden. *See* the steamship route 457 (b) (i).

Route 1,230. Adelaide, Melbourne or Hobart to Colombo

(a) April to November.—Proceed as in Route 1,228 (a) to Torres strait, and thence through the Arafura sea *(see* Note under Route 1,215 (a)) joining Route 1,216 (a).

(b) December to April.—The southern route (round Cape Leeuwin) is taken from December to April, when easterly winds are prevalent on the south coast of Australia. When round Cape Leeuwin stand to the north-westward into the South-East Trade and enter the North-West Monsoon in about lat. 10° S., long. 90° E. Thence steer northward with the North-West Monsoon across the equator in about long. 87° E., and with the North-East Monsoon to Colombo, remembering that this is the cyclone season in the South Indian ocean.

Route 1,231. Adelaide, Melbourne or Hobart to the Bay of Bengal

(a) April to November.—Proceed through Torres strait as in Route 1,228 (a) and thence through the Arafura sea *(See* Note under Route 1,215 (a)). Keep in the South-East Trade until the meridian of 85° E. is reached, and then stand north-westward to cross the equator in about long. 80° E. From this point proceed direct allowing for the strong easterly current. *See* Notes at the end of Routes 1,093 and 1,184.

(b) December to April.—Pass round Cape Leeuwin as in Route 1,230 (b), and then steer north-westward through the South-East Trade so as to enter the North-West Monsoon in about long. 85° E.; then shape course towards Ujong Masam Moeka (Achin head), and proceed westward of the Nicobar and Andaman islands to destination. *See* Notes at the end of Routes 1,093 and 1,184.

Route 1,232. Adelaide, Melbourne or Hobart to Singapore

(a) April to November.—Two alternative routes are available between April and November, viz., north-about through Torres strait or south-about round Cape Leeuwin. The former is probably the better, but if able to make to the westward around Cape Leeuwin, the latter is suitable so far as the passage northward from Soenda straat is concerned.

(i) Via Torres strait.—Take Route 1,228 (a) as far as Torres strait, and thence Route 1,218 (a) (i) or (ii) to Singapore.

(ii) Via Cape Leeuwin.—Pass round Cape Leeuwin as in Route 1,230 (b) and thence steer to the northward to join Route 1,225 (1) (a), from Fremantle to Singapore.

(b) December to April.—In spite of the prevailing easterly winds southward of Australia during these months, the Southern Route ((iii) below) is not recommended for Singapore on account of the northerly winds and southerly currents prevalent between November and March in Soenda, Banka, Gaspar and Karimata straten. A vessel has been known to take 30 days from Soenda straat to Singapore, at this time of year, a distance of 500 miles.

It is therefore advisable to proceed by the Outer route of the eastern Australian coast, through Torres strait as described in (i) below.

Or, as an alternative to take the route eastward of New Guinea, and through Surigao strait into the China sea. *See* (ii) below.

(i) Via Torres strait.—Follow Route 1,228 (a) to Torres strait and then take Route 1,216 (b) to Singapore.

(ii) Eastward of New Guinea.—Having taken Route 1,256 to the vicinity of Sydney, follow thence Route 1,267 (b) to Singapore.

(iii) Via Cape Leeuwin.—Pass round Cape Leeuwin as in Route 1,230 (b), and thence steer to the northward to join Route 1,225 (1) (b) (i) or (ii), Fremantle to Singapore.

For routes from Adelaide or Melbourne to Sydney or to New Zealand, see Part III., Chapter I.

Route 1,233.—*Reserved as spare.*

(v) ROUTES FROM SYDNEY TO PORTS IN THE INDIAN OCEAN

For routes from Sydney to ports in the Pacific ocean, see Part III., Chapter I.

Route 1,234. Sydney to Adelaide or Melbourne via Bass strait

See also Route 1,258.

(1) From Sydney to and through Bass strait.

(a) Direct route.—In order to take advantage of the current as far as Cape Howe, which appears to run strongest from November to March, keep along the outer edge of the 100-fathoms (182^{m}9) line of soundings, or a distance of 15 to 18 miles from the coast, where the current runs stronger and with more regularity than elsewhere.

From about 15 miles eastward of Cape Howe, if the wind is southerly, do not steer a more westerly course than 212° until in lat. 39° 30′ S. on account of the danger to be apprehended from south-easterly or southerly gales upon the Ninety mile beach between Cape Howe and Corner inlet. On reaching the parallel of 39° 30′ S., steer to pass about 3 miles northward of Wright rock, and the same distance southward of the south point of Deal island, the south-easternmost of the Kent group. Having passed the Kent group, steer to pass 2 or 3 miles south of the Sugarloaf rock, leaving the Judgment rocks on the starboard hand.

From the Sugarloaf steer 15 or 20 miles to the northward of King island, if the wind permits; but should the wind hang to the westward of North, a course may be safely directed for the north extreme of Three Hummock island, taking care to avoid the Mermaid and the Taniwha rocks, passing afterwards north or south of King island, as may be most favourable; the former is preferable.

Navigational Notes.—Local experience has shown that with westerly and south-westerly winds smoother water is found near the coast between Shallow inlet and Conran point, known as the Ninety mile beach; and as south-westerly winds are the prevailing ones, mariners bound westward may often take advantage of the smoother water and an absence of danger to approach the beach, instead of avoiding it. A vessel in-shore when an easterly gale is threatened should at once get an offing; these gales give signs of warning.

Between December and March, as westerly gales veer to the southward, it is advisable to stand toward the Tasmanian coast, and so be ready to take advantage of the shift of wind.

Between April and November, and more particularly in September, October and November, the same course cannot be recommended; then the wind does not shift for a continuance, but is constantly shifting to the west-north-westward.

(b) Via Banks strait.

(i) General remarks.—Banks strait lies between Flinders islands and the north coast of Tasmania, and offers an alternative entrance to Bass strait. The chief dangers to be avoided on the southern shore are the reef and rocks off Swan islands, and the foul ground and rocks northward of Foster islets. It may, however, be noticed that a vessel from the south-eastward can close the shore when Mount Pearson is over Cape Naturaliste bearing 177°, as she will then be westward of Mussel rock, Black reef, and the rocks that lie off the coast.

(ii) Working through to the westward.—In the summer months when westerly gales are of short duration it is advisable to stand towards the Tasmanian coast, to take advantage of the shift of wind.

There is a good navigable channel between Swan isle and the coast, but in consequence of the strength of the tidal streams it is well to give a wide berth to the foul ground extending from Swan islands and Foster islets. The leading mark for mid-channel is Mount William in line with rocky part of coast north of Mussel Roe bay bearing 151°.

(2) To Melbourne.—Proceed as in (1) (a) above as far as Sugarloaf rock, and then proceed to the entrance to Port Phillip as directly as circumstances permit.

(3) Bass strait to Adelaide.—In fine weather, from off Cape Otway steer to pass about 5 miles southward of Cape Nelson, 10 miles south-westward of Capes Northumberland and Banks, thence make a direct course to Cape Willoughby. Care must at all times be taken to guard against a set towards the land, but with southerly and westerly winds the coast should be given a much greater berth, as a current of one knot sometimes sets towards it between Cape Otway and Cape Willoughby.

In entering the Gulf of St. Vincent by Backstairs passage, the Young rocks, lying east-south-eastward 32 miles from the Cape Couedie, must be given a wide berth at night, but they are not dangerous by day, as one of them is 30 feet (9^{m}1) high, although the South-West rock is only 5 feet (1^{m}5) above water. At 10 or 12 miles to the southward of Cape Willoughby, after south-west gales, there is a tide race with heavy breaking seas, dangerous for deeply laden vessels or small craft. To pass eastward of it keep Cape Willoughby light bearing less than 343°

(4) Bass strait to Spencer gulf.—Proceed as in (3) above to Cape Northumberland. From Cape Northumberland to Spencer gulf, give a good berth to the South-West Young rock, which is only 5 feet (1^{m}5) high; and except with strong south-easterly winds, make allowance for the easterly set which usually prevails. From December to March, with south-easterly winds, a current runs about one knot to the north-west. *See also* Australia Pilot, Vol. I.

caution. In the event of threatening weather from the south, and westward, care must be taken to secure a good offing.

Route 1,235. Sydney to the Cape of Good Hope and to all ports in the Indian ocean

caution. October and November are unsuitable months in which to start a passage from Sydney to the westward, either by Torres strait or southward of Australia.

(a) March to September.—Northward of Australia.—The prevalence of strong westerly gales renders the southern route very difficult, indeed, generally impracticable, for sailing vessels, from April to November. The worst months for making a passage to the westward are September, October and November, for westerly gales are then of frequent occurrence, the wind sometimes being from west-south-west to west-north-west for more than a week at a time, and blowing very strong. From December to August, northerly winds are very common.

Under these circumstances, the best route to the westward is via Torres strait, and the Arafura sea, taking (by preference) the Outer Route from Sydney through the Coral Sea to the Great North-east passage into Torres strait. *See* Route 1,266 (a), and Australia Pilot, Vols. III. and V.

From Torres strait take the following routes:—

(1) To Calcutta.—Route 1,217 (a).
(2) To Cape of Good Hope.—Route 1,215 (a).
(3) To Colombo.—Route 1,216 (a).
(4) To Fremantle.—Route 1,214 (a).
(5) To Hong Kong.—Route 1,219 (a).
(6) To Singapore.—Route 1,218 (a) (i) or (ii).

(b) December to March.—Southward of Australia.

(i) Sydney to Cape Leeuwin.—If bound westward from Sydney from December to March, proceed through Bass strait, or round Tasmania; easterly winds prevail in the strait and along the south coast of Australia at that season, and good passages have been made by keeping to the northward of lat. 40° S., and passing round Cape Leeuwin into the South-East Trade wind, which then extends well to the southward. A vessel from Bass strait bound round Cape Leeuwin is recommended, with a favourable wind, to shape a course which will lead about 150 miles south of that cape.

Navigational note.—In adopting this route advantage must be taken of every favourable change of wind, in order to make westing; and it is advisable not to approach too near the land, as it would become with south-west gales, which are often experienced, even from December to March, a most dangerous lee shore, and the contrary currents run strongest near the land.

(ii) Onward from Cape Leeuwin.—After rounding Cape Leeuwin, stand to the north-westward into the South-East Trades, and join one of the routes tabulated below.

(1) To Aden.—Route 1,222 (b).
(2) To Calcutta.—Route 1,224 (b).
(3) To Cape of Good Hope.—Route 1,221 (2) (b).
(4) To Colombo.—Route 1,223 (b).
(5) To Mauritius.—Route 1,221 (1).

Routes 1,236 to 1,250.—*Reserved as spare.*

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PART III PACIFIC OCEAN

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SECTION C. PART III.

Chapter I

SAILING-SHIP ROUTES FROM PORTS IN AUSTRALIA AND NEW ZEALAND, AND AMONG THE ISLAND GROUPS OF THE SOUTH PACIFIC OCEAN

(i) ROUTES FROM SOUTH AFRICA (TO PACIFIC OCEAN PORTS ONLY) AND FROM ADELAIDE, MELBOURNE AND HOBART

Route 1,251. Main route across the Southern ocean from South Africa to Cabo de Hornos (Cape Horn)

The Main route across the Southern ocean from the Cape of Good Hope *(See* Route 1,091 (7) (a)) passes southward of Tasmania, in about long. 147° E., between the parallels of 45° S. and 47° S. From this position a vessel should proceed by one of the following routes:—

(a) Usual route.—All seasons.—Pass round the south end of New Zealand in about lat. 48° 30′ S., clear of The Snares (*Lat. 48° 01′ S., Long. 166° 36′ E.*). From this point steer to the eastward between Bounty islands (*Lat. 47° 41′ S., Long. 179° 03′ E.*) and Antipodes islands (*Lat. 49° 40′ S., Long. 178° 50′ E.*), whence, inclining slightly to the southward, the route assumes, as a mean track, the parallel of 51° S. from the meridian of 150° W., across the ocean to long. 120° W.; keeping at about 60 miles northward of this parallel from December to February (so as to be more clear of ice), and at 60 miles to the southward of it from June to August; but in this case, also, dependent on ice conditions. *(See* Note under (b), below). From the meridian of 115° W., incline gradually to the southward, to round Islas Diego Ramirez and Cabo de Hornos (Cape Horn) *(see* Routes 1,375, 1,401 and 1,083 to 1,087, inclusive).

(b) Alternative route.—Summer only.—Some navigators take, during the summer months (December to February) a more southerly route from the position southward of Tasmania, so as to pass between Auckland islands and Campbell island in about lat. 52° S, and make the passage across the Pacific ocean in between lat. 54° and 55° S.

This course would, with a sea clear of ice, and favourable weather, doubtless ensure the quickest passage, as being the shorter distance, but experience has proved that at nearly all seasons of the year so much time is lost at night and in thick weather, and even serious danger incurred on account of the great quantities of ice met with in these higher latitudes, that a parallel even as far north as 47° has been adopted with advantage. Between this latter parallel and that of 50°, it is believed the mariner will experience steadier winds, smoother water, absence of ice, and will probably make as short a passage, and certainly one in a more genial climate, and with more security, than in a higher latitude.

Note.—The seaman in navigating this wide expanse of ocean, and also for rounding Cabo de Hornos, should be provided with the Ice chart of the Southern Hemisphere, No. 1,241, published by the Admiralty, wherein he will find much useful information.

Route 1,252. Adelaide, Melbourne, or Hobart to Cabo de Hornos

(1) From ADELAIDE.—Steer south-eastward to join the main route across the Southern ocean *(Route* 1,251), in about lat. 46° S., long. 146° E.

(2) From MELBOURNE.

(a) Summer months (December to February).—Shape course to pass about 60 miles westward of King island and thence westward of Tasmania to join the main route as in (1) above. *See* Caution under Route 1,256 (b).

(b) Winter months and alternative to (a).—Pass through Bass strait, and then steer to join the main route southward of the Snares in about lat. 48° 30′ S. *See* Route 1,251 (a).

(3) From HOBART.—Having cleared Storm bay, shape course to join the main route southward of the Snares, in about lat. 48° 30′ S. *See* Route 1,251 (a). If preferred during the summer months Route 1,251 (b) may be joined between Auckland islands and Campbell island.

Route 1,253. South Africa, Adelaide, Melbourne or Hobart to Chilean ports

First proceed to the position in lat. 48° 30′ S., southward of the Snares, described in Route 1,251 (a) and Route 1,252 (1), (2) or (3), and thence make easting across the Pacific ocean between the parallels of 46° and 48° S., being towards the southern of these latitudes in March, and towards the northern in August, as far as long. 112° W.; from which point steer as directly as possible for destination, bearing in mind the north-going current running up the whole west coast of South America.

Route 1,254. South Africa, Adelaide, Melbourne or Hobart to San Francisco or British Columbia

First proceed to the position southward of the Snares as described in Route 1,251 (a) and Route 1,252 (1), (2), or (3), and thence make for a position in lat. 41° S., long. 138° W., keeping about 60 miles northward of the direct line to this point in September, and 60 miles southward of it in March. From the position in lat. 41° S., steer to cross lat. 30° S., at long. 124° W., and from this point make nearly north through the South-east Trades, crossing the equator at long. 116° W.

After picking up the North-East Trade in about lat. 10° N., steer a course as follows, according to season:—

In November and December, to cross the parallel of 30° N., at long. 131° W.

In June and July, to cross the parallel of 30° N., at long. 136° W.

At other times of the year, to cross the parallel of 30° N., at intermediate positions between the above longitudes.

From the parallel of 30° N., proceed as direct to destination as the winds, which are prevailing westerly, and the current, which crosses the track, running in a south-easterly direction, at a rate of 20 to 30 miles a day, will allow. *See* also Route 1,407, which joins this route soon after crossing the equator.

See Section D. Part II. Index on pages 349 and 350, and Part III. Index on pages 357 and 358.

Route 1,255. Melbourne to New Zealand

(a) Starting with a westerly wind.—Steer to pass Rodondo island and then northward of the Kent group, proceeding thence as follows:—

(1) To PORTS IN SOUTH ISLAND.—Steer for a position in lat. 48° 30′ S., southward of the Snares and thence to destination.

(2) To WELLINGTON.—Steer direct for Cook strait.

(3) To AUCKLAND.—Steer for the Three Kings islands, and thence round the northern point of New Zealand to Auckland.

(b) Starting with an easterly wind.—If, on leaving Port Philip, the wind should blow from the east, it may be desirable to run to the southward, passing westward of King island, and then proceed along the west coast of Tasmania; being prepared for the prevailing westerly or south-westerly winds, when this coast becomes a dangerous lee shore. Having rounded the outlying dangers off the south coast of Tasmania, proceed for the position and destination given in (a) (1), (2), or (3). *See* Caution under Route 1,256 (b).

Route 1,256. Adelaide or Melbourne to Sydney

(a) Via Bass strait.—First steer for Rodondo island, passing about 20 miles south of Cape Otway if bound from Adelaide.

Having passed Rodondo island and the Kent group, steer for a position about 20 miles to the south-east of Rame head and make Gabo island light or the land in the vicinity of Cape Howe; but should it blow hard from the southward, a more easterly course should be steered to avoid Ninety-mile beach, extending from Corner inlet for 150 miles, or nearly to Cape Howe, which would then be a dangerous lee shore. From a position east of Cape Howe, steer to the northward along the east coast for Port Jackson at such distance from the land as the wind and weather would suggest, bearing in mind that the current generally sets to the southward at a distance of 20 to 60 miles from the land. Having made the Outer South head light enter the port, noting the directions given in Australia Pilot, Vol. II., and that they are designed for steamships; nevertheless the directions should prove of value even to sailing-ships.

CAUTION. A vessel making the coast in thick weather should not neglect sounding. The 100 fathom ($182^{m}9$) line is well defined and lies 9 to 10 miles or more from the coast, except off Montagu island, from which it is distant only about 5 miles. Unless very sure of her position a vessel should not get into soundings of less than 50 fathoms ($91^{m}4$).

(b) Southward of Tasmania.—If on leaving Adelaide or Melbourne, there should be an easterly wind, it might be desirable to run to the southward; if from Melbourne, passing between Cape Otway and King island. Thence proceed down the west coast of Tasmania, giving it a good berth, for it forms a dangerous lee shore in westerly or south-westerly winds, which may occur before a vessel is clear to the southward. Having rounded the outlying dangers, southward of Tasmania, steer a northerly course to destination, following the directions given in (a), above.

CAUTION. It is often necessary, and in heavy westerly weather desirable, to make this passage at a considerable distance from the coast of Tasmania; namely at from 120 to 250 miles from the west coast, around the southern end of the island, and at the same distance from the eastern side, curving gradually towards Port Jackson.

Route 1,257.—*Reserved as spare.*

(ii) ROUTES FROM SYDNEY TO PORTS IN THE PACIFIC OCEAN

For routes from Sydney to ports in the Indian ocean see Routes 1,234 *and* 1,235.

Route 1,258. Sydney to Hobart, Melbourne or Adelaide

In all cases when proceeding south from Sydney, keep at between 20 and 60 miles from the coast, so as to derive the full benefit of the southerly current.

(1) To MELBOURNE OR ADELAIDE.

(a) Via Bass strait.—Follow Route 1,234 if the wind permits.

(b) South of Tasmania.—Take the reverse of Route 1,256 (b).

See Australia Pilot, Vols. II. and I., for entering Port Phillip and Adelaide.

(2) To HOBART.—On entering Storm bay from the eastward, after rounding Cape Pillar and Cape Raoul, stand over towards Cape Frederick Henry, and steer thence along the north-east coast of Bruny island for the entrance of Derwent river. In working against a north-west wind work up along the same coast, to avoid the strong outset from Frederick Henry bay.

If, when off Betsy island, the wind should blow from the north-westward, so as to prevent a vessel from working into Derwent river, good anchorage may be obtained either in Adventure bay or Frederick Henry bay. In calms or light winds vessels may, if necessary, anchor with a stream or kedge in Storm bay until they get a breeze.

Route 1,259. Sydney to New Zealand

(1) To AUCKLAND.—There are two routes, according to time of year, though it is sometimes possible to make a direct course to sight and to pass 10 miles northward of the Three Kings Rocks, and thence around the North Cape of New Zealand. Sailing ships not having a commanding breeze, should not attempt to pass southward of the Three Kings rocks.

The two seasonal routes are as follows:—

(a) September to April.—On leaving Port Jackson, edge away to the north-eastward to cross the meridian of 170° E. at lat. 30° S. Thence proceed as directly as possible to Auckland.

(b) May to August.—Take a more southerly route, and cross long. 170° E. in lat. 32° S. Thence continue as in (a).

(2) To WELLINGTON.—Take as direct a route as possible to Cook strait, noting that the best time of year for this passage is October to February.

(3) To PORT CHALMERS OR TO ADJACENT PORTS.—Steer for the position southward of the Snares, as described in Route 1,260 below. From this position proceed as directly as possible to destination.

Note.—The passage round the south-west end of South island and through Fouveaux strait is also possible, but it is not recommended.

Route 1,260. Sydney to Cabo de Hornos (Cape Horn)

At all seasons and from whatever quarter the wind may blow, it is advisable on leaving Port Jackson to proceed to the southward rather than to the northward of New Zealand. Advantage therefore should be taken of the most favourable winds for either reaching the position in about lat. 48° 30′ S., between the Snares and Auckland isles, to join Route 1,251 (a) or, if baffled by southerly winds and favoured by fine weather, the passage through Cook strait may be taken with advantage, especially from October to February, joining Route 1,270 (2) from Wellington off that port.

See also Route 1,251 (b) for an alternative route if passing southward of New Zealand.

Route 1,261. Sydney to ports on West coast of South America

Take Route 1,259 (1) (a) or (b), according to season as far as the meridian of 170° E., and from thence proceed to destination as given below.

(1) To ports between Puerto Talcahuano and Iquique.—Steer to cross the 180th meridian in about lat. 35° S., and long. 150° W., between lat. 39° and 43° S., being to the northward in November and December, and to the southward in April and May. Cross the ocean between these two parallels as far as long. 106° W., and from that point curve the track gradually northward for the port of destination, making due allowance for the north-going current along the coast of South America. The winds will be usually from some southerly direction.

(2) To ports between Iquique and Panama.—Steer to cross the 180th meridian between lat. 33° and 34° S., and cross the ocean on a nearly easterly course, not going southward of lat. 36° S. On reaching the meridian of 100° W., begin to make to the north-eastward through the South-East Trades to destination, making allowance for the north-going set along the coast up to the equator.

Route 1,262. Sydney to San Francisco or British Columbia

(a) Via Tahiti.—Pass either north or south of New Zealand, or through Cook strait, according to the direction of the wind on leaving; but preferably through Cook strait. Thence make to the north-eastward so as to cross lat. 30° S. in about long. 160° W., and then northward through the South-East Trades, passing closely westward of the Îles de la Société (Tahiti).

In June, July and August, cross the equator in long. 148° W., but from October to February in 151° W., steering through the doldrums to a position in lat. 10° N., long. 143° W., where the North-East Trade wind should be picked up. Stand through the trade wind so as to cross lat. 30° N. at long. 152° W., and from this point, where the westerly winds should begin to be felt, make as directly as possible for destination. From November to February, the turn to the eastward can usually be made at about lat. 33° N., but in August stand northward to the 40th parallel before turning towards the land. Allowance must be made for a current setting to the south-eastward and southward more and more strongly as the United States coast is approached. It is also felt off the coast of British Columbia, but is there complicated by tidal streams. *See* Caution under Route 1,336.

See also Route 1,263 (1) for alternative route as far as Tahiti.

(b) Alternative route via Fiji.—On leaving Port Jackson take Route 1,259 (1) (a) as far as the meridian of 170° E.; thence continue eastward (nothing to the northward) as far as long. 176° E., when course may be altered towards the Fiji islands.

If not calling at Fiji, pass eastward of the group and thence steer due north to cross the equator and lat. 18° N. on the 180th meridian; thence stand more to the eastward to cross the meridian of 172° W. in lat 30° N. From this point proceed as directly as possible to destination.

Route 1,263. Sydney to, and among, South Pacific islands

(1) To Tahiti.—Proceed from Sydney through Cook strait; from thence run down easting southward of 40° S., until in long. 156° or 155° W., then edge away to the northward to cross lat. 30° S. on the meridian of Tahiti and from thence proceed direct, or, if the wind does not permit, follow the route to Tahiti given in Route 1,262 (a); *see* also that route for an alternative passage from Sydney.

(2) To Fiji.—Follow Route 1,262 (b).

(3) To other South Pacific islands, and amongst them.—When bound from the southern or eastern coasts of Australia to any of the above-mentioned islands, precise directions cannot be given on account of the irregularity of wind; but, as a general rule, easting must be made southward of the trade wind limits, *i.e.*, in about lat. 32° S. This is, however, liable to interruption, especially between January and April. When on the meridian of the island to which bound, the trade wind may be entered, and the ship sailed well free, as the current will be found setting to windward until near the islands.

For all practical purposes of navigation between the various groups of islands, it is important to draw attention to the fact that they lie within the limits of the South-East Trade wind and of the equatorial current. For sailing vessels this means a favourable wind and current when proceeding from eastward to the westward, excepting with regard to currents when within the limits of the Equatorial Counter-current; and a beat to windward against the current and a choppy sea, when bound in the opposite direction.

(4) To Nouméa (New Caledonia).—Pass between Lord Howe island and Elizabeth reef and thence direct. The passage in a sailing vessel varies from 5 to 28 days, and it is seldom made without encountering a gale.

Route 1,264. Sydney to Yokohama

The first two routes, (a) and (b), described below are those recommended by modern navigators; they carry a vessel as far as the equator. From this point onward to Yokohama the route again varies according to the time of year; the variations are given in (c) (i), (ii) and (iii).

There are, however, alternative routes which may be taken; these are known respectively as the "Eastern," "Middle," and "Western" Routes, of which the two former are appropriate between November and March (North-West Monsoon) and the latter (the Western route) from April to October. They are described in (d) (i), (ii), and (iii) below they do not differ greatly from (a), (b) and (c).

(a) During North-West Monsoon.—November to March.—Pass between Lord Howe island and Elizabeth reef and thence northward between D'Entrecasteaux reefs on the east, and Bellona and Chesterfield reefs on the west; thence between the Solomon and Santa Cruz islands, crossing the equator in about long. 166° E. at about 60 miles westward of Nauru (Pleasant island). Continue as in (c) below.

(b) During South-East Monsoon.—April to October.—On leaving Port Jackson, steer directly to the north-eastward, to the 157th E. meridian; then northward between Kenn and Bellona reefs, eastward of Pocklington reef, and either through Bougainville strait or through Pioneer channel, between the westernmost Solomon islands and New Ireland, crossing the equator at about long. 155° E. From this point continue as in (c) below.

(c) Continuation of (a) and (b) to Yokohama.

(i) January to June.—Steer direct for Yokohama, passing to the eastward of all the Caroline islands.

(ii) July and August.—Take a more easterly track, passing about 100 miles westward of the Marshall islands, and crossing the meridian of 160° E. at lat. 18° N., and steering thence direct to destination.

(iii) September to December.—A track midway between (i) and (ii) above is recommended.

(d) Alternative routes.

(i) The Eastern route is to Norfolk island, thence to Matthew island, and north along the 171st E. meridian to lat. 11° S., across the equator in 166° E. and through the eastern part of Caroline islands.

(ii) The Middle route is midway between Lord Howe island and Elizabeth reef, westward of New Caledonia, between Solomon and Santa Cruz islands, across the equator in long. 159° E., and through the middle of the Caroline islands.

(iii) The Western route is along the 157th E. meridian, due north to 11° S. latitude; thence through Bougainville strait, and across the equator in long. 153° E., when a direct course may be steered for Yokohama.

Route 1,265. Sydney to Hong Kong

There are three routes, Middle, Western and Torres strait, available according to season.

(a) October to March (North-West Monsoon).

The Middle route.—On leaving Port Jackson, steer so as to pass midway between Lord Howe island and Elizabeth reef. From this point pass northward between Bellona reefs and New Caledonia, and thence between the Solomon and Santa Cruz islands, to the equator in long. 159° E. Thence steer through the middle of Caroline islands direct to port, passing northward of the Philippine islands.

The passage may be expected to be made in from 40 to 44 days.

(b) April to June (First part of South-East Monsoon).

The Western route.—On leaving Port Jackson, steer north-eastward to the 157th E, meridian, and then due north to lat. 11° S.; thence continue through Pioneer channel, between New Ireland and the Solomon islands, or through Bougainville strait, crossing the equator in about long. 153° E. From this position steer to pass through the western part of the Caroline islands, and through Balintang channel to the China sea.

(c) July to September (second part of South-East Monsoon and South-West Monsoon in the China sea).

The Torres strait route.—This route may be taken provided the vessel is through Torres strait before the end of September; if not, the Middle or Western route must be taken. The Torres strait route may be expected to occupy 40 days, and although not free from danger, may be navigated in safety by those with experience amongst coral reefs, and accustomed to con their vessels from the masthead.

The passage from Sydney to Torres strait is described in Route 1,266. Having passed through the strait, take one of the following routes:—

(i) Steer to pass through Wètar straat and passage into the Flores sea, and thence along the northern side of all the islands and through Sapoedi straat. From Sapoedi straat stand northward to pass through Karimata straat and thence proceed direct up the China sea. *See* Chapter II. and Index in Section C., Part II.

(ii) Steer to pass round the north-end of Timor, through Ombai straat, Sawoe (Savu) sea and Soemba straat to Alas straat; thence steer northward to pass through Karimata straat as in (i).

Alternatively, a vessel may pass southward of Timor and Soemba to Alas straat, but this route leads through a part of the Arafura sea in which there are many known, and quite possibly as yet undiscovered, dangers. *See* remarks in Route 447 (c).

(iii) Steer between Aroe and Tanimbar eilanden to Manipa straat. Thence pass round the north end of the Celebes and across the Celebes sea, through Basilan strait into the Sulu sea. Pass through Mindoro strait into the China sea and thence proceed direct to Hong Kong.

Note.—Descriptions of most of the straits mentioned above, and directions for the passage through them, will be found in Section C., Part II., Chapter II. *See* Index on pages 247 to 251.

Route 1,266. Sydney to Torres strait

There are two routes, the Outer and the Inner; and the proper time of year for making either passage is from March to September (South-East Monsoon).

It is not desirable to be up with the entrance of Torres strait before the beginning of April, in order to avoid the chance of an equinoctial gale, as well as to make sure of the South-East Monsoon having well set in, in the Arafura sea. Vessels have left Sydney as late as October, and made their passages; yet, generally speaking, it is much too late; for although the North-West Monsoon does not blow until November, and sometimes later, the calms and light variable winds that precede it protract the passage very much.

Large sailing vessels now very seldom take the Inner route, but a considerable number of small sailing vessels do so without difficulty.

Note.—Fogs rarely occur off the coast of Australia, except in the summer months, October to April, and then seldom last longer than from dawn to 10 a.m. When the sea breeze is blowing, it is accompanied by a thin haze, which envelopes the land and renders it indistinct; this haze is dispersed by the land wind.

(a) The Outer route.—The Admiralty charts of the Coral sea afford at a glance the best view of the Outer route, from the parallel of Sandy cape to Torres strait; and if the tracks shown on the charts, which lead through the most frequented part of the Outer route, be followed there will not be much cause for anxiety before reaching the Great North-East channel, which leads from the Outer route inwards through the reefs to Torres strait proper, directions for which are given below.

The other principal entrance to Torres strait from the Coral sea is through Raine Island entrance, but sailing vessels are recommended to use the Great North-east channel. Directions for the approach to, and passage through Raine Island entrance are, however, given in (ii) below.

On leaving Port Jackson, and bound northward, avoid the south-going coast current by keeping within about 2 miles off the land, though the wind may be puffy.

As soon as conditions are favourable, it is recommended to make the most direct course to approach the southern entrance of the Outer route on the parallel of 24° S., and the meridian 157° E.

Having crossed the parallel of 24° S. in long. 157° E., steer about 355°, allowing for current, for 170 miles, when the vessel will have passed 70 miles eastward of Cato bank and Wreck reef, and will be in lat. 21° 10′ S., long. 156° 45′ E., or 50 miles eastward of Kenn reef. Then steer about 323° for 430 miles, to lat. 15° 30′ S., long. 152° 00′ E., passing 50 miles eastward of Lihou reef. From this position proceed as in (i) or (ii) below.

(i) Via Great North-east channel.—Steer 313°, allowing for current, for a distance of 560 miles, to lat. 9° 00′ S., long. 145° 07′ E. This course will lead about 25 miles north-eastward of the Eastern fields, and 30 miles north-eastward of Portlock reefs. The vessel should carry no more sail at night than she will conveniently bear if suddenly hauled to the wind; and every precaution should be taken against unknown dangers, which in this comparatively little-known region may possibly exist.

From lat. 9° 00′ S., long. 145° 07′ E., steer to a position about 4 miles southward of Bramble cay, and thence follow the recommended track as indicated in pecked line on the chart.

(ii) *Via Raine Island entrance (Lat. 11° 35′ S., Long. 144° 02′ E.).*—Although the distance by this route is about 90 miles less than (i) above, entering the Great Barrier reef by Raine Island entrance is necessarily attended with more risk and anxiety, and the saving of distance is insufficient to warrant this course for a sailing-vessel except in special circumstances.

From the position in lat. 15° 30′ S., long. 152° 00′ E., above-mentioned, steer about 298° for a distance of 520 miles to the island, passing 70 miles north-eastward of Diane bank, and 50 miles north-eastward of Osprey reef. The directions for the passage, by steamships, through Raine Island entrance and onward to Torres strait, are given in Australia Pilot, Vols. III and IV. These directions should be studied by the masters of sailing-ships.

Note.—If through thick weather or other unfavourable circumstances, the vessel is so much out of reckoning as to miss Raine island and Pandora entrance also, the Great North-east channel is the only opening to leeward recommended, although a vessel may pass through Olinda, or Yule entrance, if hard pressed, or even through one of the gaps further north. When running to the northward for the Great North-east channel, steer nearly parallel with the Great Barrier reefs, and at such distance from them as circumstances may render necessary. As this route is little known, much is left to the discretion and vigilance of the navigator, especially when passing between the barrier and the outer chain of reefs, which lie south-eastward of Murray island, and contract the channel to about 20 miles in width. Having reached the parallel of 9° 05′ S., bear up to the westward for Bligh entrance, and proceed generally as directed in Australia Pilot, Vol. III, noting that the directions given therein are intended for steamships.

(b) The Inner route.—Proceed as directly as possible up the coast to Sandy cape.

The prevailing wind off the coast to Sandy cape being north-easterly from October to April, and westerly from May to September, the seaman will use his own discretion in getting to the northward against the strong southerly current generally running along the coast. The strength of this current is found on the edge of the 100-fathoms (182^{m}9) line of soundings, from 10 to 30 miles from the coast, and will be avoided by keeping well outside this line.

Curtis and Capricorn channels are the only entrances into the Inner route from the south-eastward; the latter is recommended. For details of these channels and of the Inner route, *see* Route 507 (a), and Australia Pilot, Vol. IV.

Route 1,267. Sydney to Singapore

(a) March to September.—During this, the South-East Monsoon period, take Route 1,266 (a), the Outer route, to Torres strait. Thence proceed by one of the following routes.

(i) As in Route 1,265 (c) (i) as far as Karimata straat and thence through Riouw straat to Singapore.

(ii) As for Route 1,265 (c) (ii) as far as Karimata straat and thence as in (i) above.

Note.—In either (i) or (ii) the passage may be made through Gaspar straten or Banka straat instead of Karimata straat.

(iii) As for Route 1,265 (c) (iii) as far as Basilan strait into the Sulu sea; thence pass through Balabac strait into the China sea and thence to Singapore.

(b) November to February (North-West Monsoon).—Steer northward to pass eastward of New Guinea and after meeting north-easterly winds, in about lat. 5° N., pass south of Mindanao, through Basilan strait, across the Sulu sea, and through Balabac strait into the China sea, and thence direct to Singapore.

Note.—For the description of the passage through the Eastern archipelago mentioned in (a) and (b) above, *see* Section C., Part II., Chapter II., and Index on pages 247 to 251.

Route 1,268.—*Reserved as spare.*

(iii) ROUTES FROM PORTS IN NEW ZEALAND

Route 1,269. New Zealand to Australian ports

In all cases steer to pass through Cook strait or round the northern end of North island. These passages are always more favourable than round the southern end of South island where westerly winds prevail.

(1) To SYDNEY AND PORTS TO THE NORTHWARD.—Having cleared Cook strait or the northern end of North island, proceed as directly as possible if bound for Sydney or Brisbane; if bound for Torres strait join Route 1,266 (a) in about lat. 24° S., long. 157° E. To ports northward of Brisbane join Route 1,266 (b) in the Capricorn channel.

(2) To MELBOURNE OR ADELAIDE. Pass through Bass strait if the wind permits; otherwise pass round the southern end of Tasmania. In either case join the routes from Sydney. *See* Routes 1,234 and 1,258.

Route 1,270. New Zealand to Cabo de Hornos (Cape Horn)

The Main route (Route 1,251) across the Pacific ocean is taken, a vessel from ports in New Zealand joining it as follows:—

(1) From AUCKLAND.—Steer as nearly as possible on a Great Circle to join the Main route in long. 148° W.

(2) From WELLINGTON OR COOK STRAIT.—Join the Main route in long. 170° W.

(3) From PORT CHALMERS.—Join the Main route at about the 180th meridian.

Route 1,271. New Zealand to ports on West coast of South America

Steer to pick up the routes indicated below at the nearest point.

(1) From AUCKLAND.—Route 1,261 (1) or (2), according to destination.

(2) From OTHER NEW ZEALAND ports.—Route 1,253.

Route 1,272. New Zealand to San Francisco or British Columbia

Steer northward so as to get through the equatorial calms, and those often found also at the limits of the southern and northern tropics, as quickly as possible. This is especially necessary in July, August and September. At all times pick up Route 1,262 (a), from Sydney as quickly as possible, and follow it to destinations.

Route 1,273. New Zealand to South Pacific islands

Make easting southward of lat. 40° S. to about long. 165° W. if bound for Rarotonga, or to long. 155° W. if bound for Tahiti; haul gradually northward into the South-East Trade, and then proceed direct.

Note.—The South-East Trade is tolerably regular among the Samoan, Tonga, Fiji and New Caledonia islands, from April to October, but from December to March it is very light and uncertain, and north-westerly winds are frequent.

CAUTION. Cyclones sometimes pass over these localities from January to March, inclusive.

Route 1,274. New Zealand to ports in China or Japan

Steer northward to pick up, at about lat. 30° S., the route from Sydney as shown below.

(1) To YOKOHAMA.—Route 1,264.
(2) To HONG KING.—Route 1,265.
(3) To TORRES STRAIT.—Route 1,266.
(4) To SINGAPORE.—Route 1,267.

Route 1,275.—*Reserved as spare.*

(iv) ROUTES FROM ANY OF THE ISLAND GROUPS BETWEEN NEW CALEDONIA AND TAHITI, ÎLES DE LA SOCIÉTÉ

General remarks on navigation between the islands.—Within the region of the Trade winds, there is no difficulty in travelling from east to west, the winds being fair.

From west to east for short distances a vessel may beat, but for long distances, as for instance from Fiji to Tahiti, or from Tahiti to Pitcairn island, a vessel should stand southward through the Trade winds into the westerly winds; then run down her easting and re-enter the Trade winds in about the meridian of the island to which bound.

See "Navigation in the Pacific ocean" at the beginning of Chapter II., of Section B., Part IV., on page 127.

CAUTIONS. *Currents.*—Particular and constant attention must be paid to the current when navigating amongst the groups; for, when near the islands, it is sometimes deflected and always accelerated. Again, most of the islands are so low that it is often impossible to see them at night, and ships may be driven on the encircling reefs without any warning from sounding, the reefs having, in general, very deep water close to.

Currents in barrier reef and atoll openings.—The streams in these passages are generally very strong, and cannot be calculated upon to turn with high and low water. Where a barrier reef is near the shore a heavy swell will throw so much water over the reef as to cause a constant set out of the opening, and at times across the fairway; a knowledge of these facts should be borne in mind when navigating such localities; an instance of this latter is very marked at Papeete, in Tahiti; also at Passe de Taapuna in the same island; again at Mururoa; and at many other places too numerous to mention.

Route 1,276. Islands (as above) to Australia or New Zealand

For passage from Tahiti see Route 1,283.

(1) To SYDNEY OR SOUTH AUSTRALIAN PORTS.—Proceed westward on about the parallel of the islands, taking full advantage of the Trade wind and the favourable current; pass about 150 miles southward of New Caledonia and then proceed as directly as possible to port, or to Bass strait if bound to South Australia. *See* Route 1,234 for passage through Bass strait and to Melbourne and Adelaide; and Route 1,235 (b) (i) for passage from Bass strait to Cape Leeuwin.

(2) TO NEW ZEALAND.—From islands eastward of the meridian of 170° W. steer westward in the Trade wind until that meridian is reached, and thence proceed as directly as possible to destination, bearing in mind that approaching New Zealand a sailing vessel should, especially in winter, keep westward, rather than eastward of the direct route; westerly winds are likely to be experienced southward of the Trade.

Route 1,277. Islands (as above) to Cabo de Hornos (Cape Horn) or to South American ports

(1) TO CABO DE HORNOS OR ESTRECHO DE MAGALLANES.—From any of the Pacific islands stand through the Trades to the southward and then into the westerly winds of the southern hemisphere; from thence, proceed by great circle to the Estrecho de Magallanes or to round Cabo de Hornos, but do not get to the southward of the Main route across the Southern ocean (*see* Route 1,251).

(2) TO SOUTH AMERICAN PORTS BETWEEN PUERTO TALCAHUANO AND PANAMA.—Stand through the Trades into the westerlies to pick up the routes from Australia to the required destination at about long. 160° W., or westward of that meridian, according to starting point. *See* Routes 1,253 and 1,261 (1) and (2). From July to October, however, a direct passage southward of Archipel des Tuamoto can usually be made, passing Pitcairn island.

Route 1,278. Islands (as above) to San Francisco and British Columbia

Stand southward (except from Tahiti) and pick up Route 1,262 (a) from Sydney *via* Tahiti, and follow it to destination.

Route 1,279. Fiji to Honolulu

Stand to the northward through both Trades and into the westerly winds northward of the North-East Trade, from thence making easting to about long. 155° W., and from thence proceed direct.

Route 1,280. Fiji to Tahiti

Stand through the South-East Trade wind into the westerlies, then run down the easting, re-entering the Trade wind in long. 150° W.

Route 1,281. Samoa to the eastward

When sailing to the eastward it will be found an advantage to keep on the southern side of the group, where there is not only a favourable current, but the winds will be found more regular and calms less frequent.

Route 1,282. Tahiti to Honolulu

Steer to the northward to cross the equator in about long. 147° W., and thence to make the Hawaiian islands from the eastward, to ensure the breeze.

Note.—Channel between Moorea and Tahiti.—This channel should never be used by sailing ships except with steady winds from the north-east or south-west, as these are the only winds that blow through the channel. When there is a fresh breeze from the eastward to the northward of Tahiti it is generally calm in this channel, and vessels have remained becalmed here for days, whilst a fresh breeze prevailed to seaward.

Route 1,283. Tahiti to Australia and New Zealand

(1) TO SYDNEY.—Run with the Trade wind, steering to pass about 150 miles southward of New Caledonia; thence proceed as directly as possible to destination. *See* Route 1,276 (1).

(2) TO WELLINGTON.—Run with the Trade wind to about long. 170° W., and thence proceed as directly as possible to destination. *See* Route 1,276 (2).

Routes 1,284, 1,285, and 1,286.—*Reserved as spare.*

Route 1,287. Thursday island to Sydney

This sailing passage appears not to have been made very often, and like that from Torres strait to Sydney by the Inner route, was formerly considered only practicable in the North-West Monsoon—from November to February or March. The first object after clearing Torres strait, in the North-West Monsoon, will be to take advantage of westerly winds for making easting, looking upon immediate progress to the southward as of secondary importance.

Directions.—When starting to the eastward from Prince of Wales channel or Cape York, in the North-West Monsoon, proceed by Raine Island entrance, following inversely the directions given for proceeding to the north-westward; or preferably by the

Great North-east channel. And having cleared the Great Barrier reefs or Eastern fields, as the case may be, take every advantage of westerly breezes, and endeavour to reach a position in about lat. 15° S., long. 156° E., going as much as practicable over the frequented route shown on the chart, and keeping an especial look-out when proceeding eastward of the route, into the unexplored space northward of Mellish reef.

Having attained the meridian of 156° E., and thus probably far enough to the eastward to take advantage of the South-East Trade, haul on a wind on the port tack and try to fetch Mellish reef; great caution is necessary when in the neighbourhood of this reef, and there is generally a strong westerly set to guard against. Pass, if the wind permit, between Kenn and Wreck reefs on the east side, and Frederick and Saumarez reefs on the west side.

Should there be too much southing in the prevailing South-East Trade wind to weather Frederick reef, pass to the westward of it, and between Saumarez and Swain reefs, when a southerly current will probably enable a vessel to weather Sandy cape, care being taken to avoid Breaksea spit and the shoal near its eastern edge.

Note.—As a rule a vessel should be so sailed as to close the intermediate passage reefs in the daytime, to take a fresh departure, as the current between Saumarez and Swain reefs may otherwise seriously affect the vessel's reckoning.

From Sandy cape proceed for Sydney by keeping the mainland in sight, to take advantage of the southerly current.

Routes 1,288 to 1,299.—*Reserved as spare.*

See Section D. Part III. Index on pages 357 and 358.

SECTION C. PART III.

Chapter II

SAILING SHIP ROUTES FROM SINGAPORE, PORTS ON EAST COAST OF ASIA, THE PHILIPPINE ISLANDS AND JAPAN

(i) ROUTES FROM SINGAPORE AND EASTERN ARCHIPELAGO

For routes from Singapore to ports in the Indian ocean, see Section C., Part II., Chapters II. and IV.

Route 1,300. Singapore to Sydney

(a) November to February.—Via Torres strait.—Leaving Singapore in the North-West Monsoon, between mid-November and mid-February, proceed through Banka straat (*See* Note below) or Karimata straat, and enter the Indian ocean by Lombok straat or Alas straat, after passing through Sapoedi straat. Having reached the Indian ocean, steer to pass northward or southward of Timor and thence to Torres strait (*See* also Route 1,206 (2)); thence take Route 1,287 to Sydney.

Notes.—(1) Near and during the period of change from the South-East Monsoon to the North-West Monsoon, sailing vessels may be five and six weeks in making the passage from Singapore to Banka straat. In the month of September H.M. surveying vessel *Saracen* had the South-East Monsoon strong, with much rain; about the equinox there were several heavy squalls. This monsoon is generally supposed to shift about the beginning of October, but during the whole of this month the wind was only four hours from the northward, there being a succession of calms, light southerly airs, a close muggy atmosphere surcharged with electricity, and frequent heavy Sumatra squalls or southwesters. On the 9th of November the monsoon shifted with furious gusts.

These squalls at this season generally take place at night, accompanied by heavy rain, thunder and lightning, and are of short duration.

(2) Directions for the passage southward from Singapore will be found in Chapter II. of Section C., Part II. *See* Index on pages 247 to 251.

(b) April to October.—Follow Route 1,207 (a) into the westerly winds, and then pass round Cape Leeuwin and proceed to Sydney via Bass strait. *See* Routes 1,091 (1) (c) and (5) (b) and 1,256 (a).

Route 1,301. Singapore to the Moluccas

Pass southward of Borneo in the North-East Monsoon and northward of Borneo in the South-West Monsoon.

(a) North-East Monsoon (October to May).—When the North-East Monsoon blows north of the equator, and the North-West Monsoon south of it, proceed through Karimata straat passing east of Ontario reef. On leaving the strait, steer to pass 10 to 15 miles southward of Annie Florence reef and about 10 miles southward of Masalembo besar (Great Solombo) eiland; thence proceed to Salcier straat as directly as possible.

After clearing Salcier straat, Ambon is easily reached by passing southward of Batoe Ata (Hagedis) and Binonko eilanden; if bound to the Ceram sea, first round the south point of Boeton eiland and then, after skirting the shore of that island, and having passed Wangi Wangi eilanden, steer northward as far as Wowoni eiland. Thence run for the south point of Soela Sanana and thence into the Ceram sea.

CAUTION.—The currents in this locality set to the southward and are very strong. If a vessel has been set to leeward of the north point of Boeroe (Buru) eiland, it is best to pass to the southward of that island, and then through Manipa straat to the Ceram sea.

(b) South-West Monsoon (May to September).—At this season, when the South-West Monsoon blows north of the equator, and the South-East Monsoon south of it, run south of the Anamba and Great Natuna islands, and then between the Royal Charlotte and Louisa shoals, taking care to avoid the dangerous shoals bordering the Borneo coast, and also the being set to leeward of Balambangan island by the northerly current which prevails in the South-West Monsoon. Having made Balambangan island, haul round its north point, and steer through Balabac strait into the Sulu sea, then through Sibutu passage or one of the passages of the Sulu archipelago, cross the Celebes sea for the north point of Celebes island, and then work south through Molucca sea.

For alternative route as far as Balabac strait during the South-West Monsoon, *see* Route 1,302 (b).

For a description of the various straits and passages mentioned in (a) and (b) above, as well as for directions for working through them, *see* Chapter II. of Section C., Part II., and Index on page 247.

CAUTION.—Mariners are warned that a strong north-west set is experienced in the southern part of the Palawan passage westward and north-westward of Balabac and North Balabac strait during the height of the North-East Monsoon.

Route 1,302. Singapore to the Sulu sea

See Route 1,127 (1) (a) (i) and (ii) for directions for Singapore strait; bound eastward these should be taken in reverse.

The main route is via Balabac strait, to which the passage is varied according to season; the passage may also be made by proceeding southward through Karimata or Gaspar straten, through the Java sea, and northward through Macassar strait, but this is not recommended except in October and November.

(a) North-East Monsoon (October to May).—Via Balabac strait.—In December, January and February, do not leave the entrance of Singapore strait in strong north-east winds, but anchor on the northern shore, under Pulau Remunia, in 9 or 10 fathoms ($16^{m}5$ or $19^{m}3$). In those months gales often occur with thick weather, the rain lasting two or three days and the south-south-eastward current outside attains a rate of $2\frac{1}{2}$ or 3 knots. A vessel leaving the strait then, instead of fetching Pejantan (St. Barbe) island, would fall bodily to leeward, and have to work up the west coast of Borneo. Fine weather follows, with the wind backing round to north and north-west; and the current in the offing decreases in strength to about $1\frac{1}{4}$ knots.

Having obtained the fine weather, the first object should be to pass through the channel between Great Natuna and South Natuna islands or, if this proves impossible or difficult, to use one of the passages to the southward. Directions for these passages are as follows:—

See Section D, Part III, Index on page 357 and 358, and Part II. Index on pages 349 and 350.

(i) Channel between Great Natuna and South Natuna islands.—Leave the anchorage off Pulau Remunia in the eastern end of Singapore strait with the first of the ebb, and keep clean full. Steer to the north-eastward to go through the channel between Subi kechil, South Natuna islands (which is lighted) and Great Natuna island, passing southward of Midai island, a passage that may be made in these months without much difficulty, especially at full and change, when, it is stated, the wind, after a few hours calm, frequently shifts to the westward with squalls and rain, and then hauls round to south-west and south, blowing moderately for 24 hours, By taking advantage of these changes the Subi islands may be easily weathered.

If after arriving in the vicinity of Midai (Low) island, nearly in the fairway south-westward of Great Natuna island, the wind continue easterly, steer to the northward on the starboard tack, passing westward of Midai island, and keeping not less than 3 miles from its south-western side to avoid the shoal water extending 2½ miles from it. Pass about 5 miles westward of Noord Hooiberg, as the coral reefs about that island extend fully 3 miles from its south-west side, with least known depths of 3¾ fathoms ($6^{m}8$). Vessels are not recommended to pass between Noord Hooiberg and Midai island, on account of the Diana reefs, which extend some 14 miles northward of Midai. There would be no danger, however if the wind permits of a vessel laying through, and passing 4 or 5 miles southward of Noord Hooiberg and Postiljon rocks, thus giving a wide berth to Diana reefs, provided those objects are available for cross bearings. The channel southward of Midai island is preferable is a vessel can lay through.

If bearing up, after passing Noord Hooiberg there will be no difficulty in working towards the south point of Great Natuna, as that island, when approached from the south-west, shelters against the strong south-west current of the monsoon. Off its southern shore at night, in fine weather, the wind is off the land, but the south and south-east shore should not be approached nearer than 6 or 7 miles, on account of the off-lying dangers.

(ii) Koti passage and Serasan passage.—If fetching to leeward of Subi islands with a northerly wind take Koti passage, between Pulau Panjang and Serasan island. The Serasan passage is also safe when either side is kept aboard, to avoid Haynes shoal, the 3½-fathoms ($6^{m}4$) patch in the fairway. The current among these islands is more regular than in Api passage, where it sets in various directions, and with considerable velocity south-westward from 16 to 19 hours at a time; for large vessels any of the other passages are preferable to this, as great caution and perseverance are requisite in working through. When using it, keep the Borneo coast aboard, in 10 to 11 fathoms ($18^{m}3$ to $20^{m}1$) water, to avoid the current and to profit by the land winds. *(See* directions below under (iii).

In taking Koti passage give Pulau Panjang a good berth to avoid the reef which surrounds it, and extending off its south-west end. The winds amongst these islands and as far eastward as the meridian of Tanjong Sirik are generally from north to north-north-west. The passage cleared, proceed to the north-eastward; endeavouring, if not certain of the longitude, to make the Royal Charlotte, or Luoisa reef, whichever is the weathermost, by running on its parallel of latitude; and as the currents appear to be influenced by the prevailing winds, a set in the direction in which it is blowing should be anticipated, the velocity of the current being proportionate to the force of the wind. Having made either the Royal Charlotte or Louisa reefs, or passing in mid-channel between them, steer to the eastward for about 100 miles towards Balabac strait, and through it to the Sulu sea. *See* China sea Pilot, Vol. II. and Eastern Archipelago Pilot, Vol. I., for the western approaches to, and passage through Balabac strait.

(iii) Borneo coast.—Api passage.—Directions.—It will frequently be found convenient for a sailing vessel to keep tolerably close to the coast of Borneo, especially when working to the windward against the north-east monsoon, as favourable tidal streams will be found near the shore when a strong current is running to the southward some distance from it. Between the Masa Tiga eilanden and Tanjong Bangkai, lat. 0° 21′ N., long. 108° 55′ E., stand towards the coast, guided by sounding, into 7 or 6 fathoms ($12^{m}8$ or $11^{m}0$); farther out, between the Greig shoals and Pilau Datoe, the depths are from 13 to 16 fathoms ($23^{m}8$ to $29^{m}3$).

Small vessels may pass in safety between Pulau Temaju and the mainland, the channel being a mile wide with depths of 7 fathoms ($12^{m}8$).

Between Pulau Temaju and Pulau Semesa stand towards the coast into 7 fathoms ($12^{m}8$) and pass on either side of Pulau Baru; avoiding the shoal off the north extreme. Northward of Pulau Semesa the channel is clear as far as Tanjong Batu Belat, lat. 0° 49′ N., long. 108° 51′ E., excepting the two charted patches of 4¼ and 4½ fathoms ($7^{m}8$ and $8^{m}2$); abreast this point the depths decrease suddenly to the shore bank, from 13 fathoms ($23^{m}8$) to 8 and 2 fathoms ($14^{m}6$ and $3^{m}7$), and must be guarded against; thence it is advisable to pass between Pulau Kabung and the 2¼-fathom ($4^{m}1$) shoals in the fairway.

The Boeroeng eilanden may be boldly approached from the westward; large sailing vessels had better pass outside them, but smaller craft may often, with advantage, pass between them, taking care to avoid charted dangers.

(b) South-West Monsoon (May to September).—Via Balabac strait.—First proceed to Api passage as described below and thence, with a fair wind, on the track shown on the charts parallel to the Borneo coast, as far as Balabac strait, and thence into the Sulu sea.

Directions.—Singapore to Tanjong Api.—As far northward as the north entrance of Singapore strait, the tidal streams are tolerably regular, but some miles off-shore a current will be found setting about north-north-west in the South-West Monsoon; its greatest strength will be experienced between Pulau Tioman and the Anamba islands.

In order to obviate the effect of this set or current, it is considered prudent to make good the course for Pulau Mendarik (Saddle island) from Singapore strait, by which, should light airs prevail, the option will be afforded of steering either between Pengibu (Victory) and Kayu Ara (Barren) islands, or south of Kayu Ara island, thus avoiding Acasta rock. This caution may appear unnecessary, the distance between Kayu Ara and Dumdum (Camel) islands being 33 miles; but a little consideration will satisfy the navigator that, upon the course shaped to counteract the current, running strong in the vicinity of these islands (to the north-eastward as near as could be determined by the lines of scum viewed from the summit of Kayu Ara island), he would not, even with a fair wind, pass more than 10 miles to windward of Pengibu and Kayu Ara islands. On leaving Kayu Ara island, shape course, allowing for a northerly set, to pass well to the southward of St. Pierre (or St. Petrus) islands (now lighted) and then keep St. Pierre light, whilst in sight, bearing 255°, which will lead about 2 miles southward of Merundung rock, the latter 8 feet ($2^{m}4$) above water.

Notes.—The depths from St. Pierre rock, and in the direct course for Tanjong Api, range between 20 and 15 fathoms ($36^{m}6$ and $27^{m}4$), and if approaching this point the first sounding under 13 fathoms ($23^{m}8$) at night should be deemed the warning. By day, as the land is neared the vessel's position may readily be determined, and there is no danger far beyond 1½ miles from the point. *See* Directions under (a) (iii), above.

Banguey South channel and Mallawalle strait between Banguey island and Borneo, are sometimes used by vessels navigating to the ports on the north-east coast of Borneo; they are somewhat intricate and demand careful navigation, being for the greater part bounded by dangers. Balabac main channel is recommended in preference to either of these channels, being considered much safer. *See* Eastern Archipelago, Vol. I. for a description and directions for these channels.

(c) Alternative route.—Via Macassar strait (October or November only).—Proceed southward to pass through Gaspar or Karimata straten, and thence eastward through the Java sea to Macassar strait, there joining the "First Eastern passage" and following it to the Sulu sea. *See* Chapter II. of Section C., Part II., and Index on pages 247 to 251.

Route 1,303. Singapore to Manila

(a) North-East Monsoon (October to May).—Take Route 1,302 (a) as far as the entrance to Balabac strait, and continue thence to the northward by the Palawan passage, between the 100 fathom ($182^{m}9$) line westward of Palawan island and that of the off-lying foul ground; a channel about 40 miles in width, except towards the southern end, where, between the Royal Captain shoal and the edge of the Palawan bank, it is 28 miles wide. This is the most dangerous part of the channel. From the northern end of the Palawan passage, in about lat. 11° N., work northward to Manila, hugging the coast by short boards when possible. *See* Caution in Route 1301 (b)

(b) South-West Monsoon (June to October).—From Singapore, take Route 1,302 (b) to Tanjong Api, the north-western point of Borneo, and then proceed directly along the coast and through the Palawan passage with a fair wind to destination. Or as an alternative route, pass southward of the Anamba and Great Natuna islands and between the Royal Charlotte and Louisa reefs, to pick up the Palawan route off Balabac strait.

Navigational notes.—For description and directions for leaving Singapore when bound eastward *see* Route 1,127 (1) (a) (i) and (ii), which should be taken in reverse.

Working through Palawan passage.—Working through the Palawan passage and having conformed to the directions given for making the south-west end of Palawan, in fine weather endeavour to make in-shore boards in the afternoon, for the sun then being astern of the vessel, the patches lying near the edge of the bank will generally be distinguished from the masthead in ample time to tack. In squally weather, also during heavy rains, these patches have been observed imparting a very distinct yellowish hue to the surface of the water. It is most desirable to get soundings before dark in order that a good departure may be made for the night. On making the in-shore board, be prepared to tack immediately on getting the first indication of the shore bank, on which a vessel is likely to come suddenly into soundings.

Approaching Balabac and Palawan islands.—If the wind be well to the southward, and the weather thick, Balabac island may be approached sufficiently near, in order to obtain a good observation of the land; but caution is necessary not to go within 12 miles of it, as soundings of 26 and 20 fathoms ($47^{m}6$ and $36^{m}6$) extend that distance off, in a westerly direction from the peak, having shoal patches immediately inside them. If the wind be to the westward, with thick cloudy weather, Balabac island should not be approached nearer than 30 miles, as westerly winds usually force a strong easterly current through the passages.

Off the south-west end of Palawan, it is not unusual, particularly in squalls, for the wind to veer to W.N.W., and sometimes N.W., blowing with violence, and placing the vessel on a lee shore with respect to the shoals inside the edge of the bank.

This weather generally prevails off Palawan about September and October, rendering it uncertain and difficult to make the narrowest part of the channel, owing to the land being obscured; especially if the position of the vessel has not been checked by observations. Under these circumstances, it is advisable to proceed with caution, arranging if possible so as to pass the Royal Captain shoal during daylight.

Route 1,304. Singapore to Hong Kong and China ports to the northward

During the North-East Monsoon make the passage either on the Main route (not recommended); via the Palawan passage; or alternatively, southward through Karimata straat, and thence southward of Borneo and through Saleier straat, to join the "Second Eastern passage" in the Banda sea. *See* Chapter II. of Section C., Part II. Near the change of monsoon take the Inner route. *See* (1) (b) (ii) below.

In the South-West Monsoon take the Main route between April and June, but in the strength of the monsoon use the Inner route. In the latter part of the monsoon the Palawan passage is recommended as strong south-going currents begin to prevail on the Main route.

(1) To Hong Kong.

(a) North-East Monsoon.

(i) Main route (not recommended).—Pass between Anamba and Natuna islands and thence between the Charlotte and Vanguard banks; from this point follow the track between the Paracels and Macclesfield bank as the general direction, and thence to Hong Kong.

(ii) Inner route (Near the change of monsoons.—For description *see* (1) (b) (ii) below.

(iii) Palawan passage route (In the strength of the monsoon.—Take Route 1,303 (a) as far as lat. 11° N., and on reaching the northern end of Palawan island keep eastward, so as to work up the coast of Luzon past Manila to Cape Bolinao, or even as far as Cape Bojeador. From either point make direct for Hong Kong passing to leeward of Pratas reef. *See* Routes 1,318 and 1,301 (b) for Cautions and anchorages.

Notes.—In working along the Luzon coast, particularly about dawn and sunset, less sea and much lighter winds will be experienced by hugging the coast by short boards, and at times even land breezes may very facilitate progress; but in the attempt to render these available, great caution should be observed, particularly between Cape Bolinao and Cape Bojeador, as several dangers are said to exist in this locality near the shore.

The first strong gust of the monsoon will be experienced on clearing Cape Bojeador, but this should not induce the navigator to stand further westward than is necessary to weather the cape, when less wind will at once be experienced. This generally is the case on all lee shores backed by mountains, either resulting from obstruction, reaction, or the effect probably, after sunset, of counteracting land winds. Among the groups northward of Luzon there are no dangers which are not easily avoided, and no continuous strong breezes will be experienced, at all comparable in force, or attended by high sea, similar to those which prevail between Cape Bolinao and Hong Kong. On the contrary, good working breezes, and at times light winds prevail, enabling a well-conditioned sailing vessel to make about six degrees northing in eight days. *See* also Caution and Note under Route 1,332.

(iv) Alternative route.—Via Karimata straat and Second Eastern passage.—This route affords a leading or fair wind and favourable currents nearly throughout.

Proceed southward to pass through Gaspar straten or Karimata straat and, having cleared all dangers southward of either strait, steer eastward through the Java sea to, and through Saleier straat to the Banda sea, to join the Second Eastern passage. *See* Chapter II. of Section C., Part II., for descriptions and directions for the whole of this route.

(b) South-West Monsoon.

(i) Main route (April to June).—Follow the track shown on the charts through the channel between the Paracels and Macclesfield bank. Pass between Anamba and Natuna islands if the South-West Monsoon has not set in. As early as April a westerly breeze will sometimes be found blowing out of the Gulf of Thailand (Siam), and continuing to Macclesfield bank, from whence easterly winds will be experienced to Hong Kong.

(ii) Inner route (In the strength of the South-West Monsoon).—Follow the steam ship route from Singapore to Hong Kong, Route 689 (b) (i).

Approaching Hong Kong, endeavour to make the Great Ladrone or Man shan island bearing about 000°, then steer between it and Gap rock or Man mi chau of the Kaipong islands; thence between Lingting and the Lema islands, and through Lema channel into West Lamma channel. After the middle of August, when easterly winds are likely to prevail several days together, as they are more or less at all seasons, it will be necessary to make the north-east head of the Lema islands, and proceed in by Lema channel towards West Lamma channel. East Lamma channel is also safe in both monsoons, for although the water is deep, if the wind fall light anchorage can be obtained, and there is little or no tide.

Note.—North-easterly and westerly gales blowing out of Tongking gulf, with dark weather and rain have been experienced on this route, causing danger of being driven among the Paracel reefs; but such gales are not frequent, and if the land be kept in sight all the time, the sea will be found to be smooth, and anchorage may be obtained if required.

(iii) Palawan passage route (In the latter part of the South-West Monsoon).—In the vicinity of Pulau Sapatu, strong south-going currents begin to prevail, with light northerly winds, variable airs and calms, beginning in the middle of October, by which many vessels have been delayed for several days, and have made no progress to the northward. Fresh winds from the southward have been met with, even so late as November 1st, but these instances are rare. In consequence of this, the Palawan passage is recommended during these months (October and November).

Steer north of Pengibu (Victory) island, and between Great Natuna and Soebi (Subi) islands; thence proceed as directed for sailing vessels taking this route in the North-East Monsoon. *See* (1) (a) (iii) above.

(2) To PORTS NORTHWARD OF HONG KONG.

(a) North-East Monsoon.

(i) Palawan passage route.—Proceed as in (1) (a) (iii) as far as Cape Bolinao, and then continue to work up the coast of Luzon, and through the Balintang channel. Thence proceed up the east coast of Formosa, and thence to destination.

See Notes under (1) (a) (iii).

(ii) Alternative route.—Take (1) (a) (iv) above, following the Second Eastern passage to destination.

(iii) The Inner route.—Take this route near the change of the monsoon as far as Hong Kong, and thence proceed northward along the coast of China to destination. *See* (1) (b) (ii) above for description.

(b) South-West Monsoon.—Take either (1) (b) (i) or (2) (a) (iii) above as far as Hong Kong, and thence continue along the China coast to destination; or in the latter part of the monsoon, take (2) (a) (i) above.

Route 1,305. Singapore to Saigon

(a) South-West Monsoon.—In this monsoon, the winds in Singapore strait are between south-east and west, and sailing vessels will have no difficulty in getting through to the eastward.

Having cleared the strait, steer to pass westward of Pulau Condore, and thence along the edge of the bank fronting the delta of the Mekong or Cambodia river, extending to the mouth of the Saigon river.

Strong freshets run out of these rivers during this monsoon, and join the north-easterly current, whereby vessels are obliged to keep the edge of the bank aboard to prevent being set to leeward of Cap St. Jacques (Cape St. James). Keep sounding continuously while steering along the edge of the bank, so as to remain in not less than 10 fathoms ($18^{m}3$). Should the water begin to shoal, haul off to the eastward, when it will soon deepen, as the depths are fairly regular. Continue along the edge of the bank in these depths until Cap St. Jacques bears less than 030°, when course may be steered as requisite for the entrance to Saigon and a Pilot embarked.

(b) North-East Monsoon.—Take Route 1,302 (a) (i), (ii), or (iii) until clear of the Natuna islands, and then steer north-eastward until reaching to about long. 112° E.; after which stand across the China sea to make Cap St. Jacques, or preferably the land to windward of that cape, to avoid being set to leeward by the prevailing current.

Notes.—From lat. 7° N. until about 70 miles eastward of the mouths of the Mekong or Cambodia river, a strong current will be found setting to the south-west governed considerably by the prevailing winds, for when strong gales blow in the early part of this monsoon, the south-westerly current is stronger, and often runs at a rate of 3 knots. The tidal streams are regular, and set strong near the Cochin-China coast during both monsoons.

In the latter part of March and April an easterly wind is often found eastward of the Anamba islands, that will take a vessel to Pulau Condore; thence work to Cap St. Jacques westward of that island, keeping towards the Cambodia coast, which is very low, and can seldom be seen at night.

From abreast the mouths of the Mekong or Cambodia river, the ebb stream will be found setting to windward, greatly assisting vessels standing in-shore; but they should not stand near these mouths during the flood stream, and on no account shoal the water to less than 12 fathoms ($21^{m}9$) in the night. Sounding should never be neglected when standing towards this low land, which may be seen from a distance of about 10 miles in clear weather.

The North-East Monsoon often blows very strong on the parallel of Pulau Sapatu, and between it and the Cochin-China coast, in December, January, February and sometimes March, continuing for two or three days with a heavy sea and strong current, the sky being generally thick and hazy throughout. A gradual rise in the barometer is a sure indication of an increase in the strength of the monsoon. Should the monsoon prove too strong to contend against, bear up for Pulau Condore, where good shelter will be found, and anchor. *See* China Sea Pilot, Vol. I.

At about 90 miles from the coast, the wind in settled weather usually hauls to east-north-east and east at about 1600 hours, continuing all night fresh and puffy. This is the time to stand in-shore, and although as far to leeward as the meridian of Cap St. Jacques, with the ebb tide under the lee, the vessel will be to windward of Cape Ti Oan (Wan) in the morning.

Route 1,306. Singapore to Bangkok

(a) South-West Monsoon.—In this monsoon, the winds prevail between south-east and west in Singapore strait, and therefore sailing vessels will have no difficulty in making to the eastward.

Having cleared the strait, shape course for Pulau Redang, and thence keep the western shore of the Gulf of Thailand (Siam) aboard, passing inside Pulau Lozin and Koh (Goh) Krah.

(b) North-East Monsoon.—Take Route 1,302 (a) (i), (ii), or (iii) until clear of the Natuna islands, and then proceed in a north-easterly direction to about long. 111° or 112° E. This can be done easily, as the wind is invariably from north to north-north-west as far as the meridian of Tanjong Sirik, when it generally veers to the north-eastward. Then stand across the China sea to Pulau Obi. Little or no current will be experienced until lat. 6° or 7° N. is gained; then it will be found setting strongly to the south-westward, governed to a large extent by the prevailing winds.

Note.—In April and May the best passages to the Gulf of Thailand (Siam) are made by keeping the Malay coast aboard; but expect squalls, calms and rain; a weak current begins to set north-eastward about this period.

Routes 1,307 and 1,308.—*Reserved as spare.*

Route 1,309. Eastern archipelago to China

Generally the various routes, according to season, are described in Chapter II. of Section C., Part II., in which a through-route index is also included.

Passing northward through the straits westward of Borneo, usually May to September, join Route 1,304 (1) (b) from Singapore to Hong Kong and China ports to the northward.

Between November and April the "Second Eastern passage" is recommended *(see* Route 1,136 to 1,138). The "First Eastern passage" can be considered in October and November, but it appears to have few advantages and a number of disadvantages.

(ii) ROUTES FROM BANGKOK OR SAIGON

Route 1,310. Bangkok or Saigon to Hong Kong or ports to the northward

(a) North-east Monsoon.—To attempt to work northward, especially in the full strength of the monsoon, is certain to prove very tedious, and therefore stand south-eastward to the Natuna islands to join Route 1,304 (1) (a) (iii) or, near the change of monsoon, Route 1,304 (1) (a) (ii), if bound to Hong Kong; if bound to ports north of Hong Kong take Route 1,304 (2) (a) (i) or (iii).

Consideration should be given to taking Route 1,304 (1) (a) (iv) or 1,304 (2) (a) (ii).

(b) South-West Monsoon.—Having cleared the Gulf of Thailand (Siam) if from Bangkok, follow generally the directions given in Route 1,304 (1) (b) or (2) (b).

Route 1,311. Bangkok to Singapore

(a) North-East Monsoon.—From Bangkok, the passage down the gulf will frequently be shortened in the North-East Monsoon, by sighting Kusrovie rock (*Lat. 11° 07′ N., Long. 102° 46′ E.*) and passing between Goh (Koh) Tang and Phu Kwok (Koh Tron). Thence keep well to the eastward of Pulau Panjang, and if bound to Singapore the passage will be made quicker by steering well out into the China sea; thence to pass about 20 miles eastward of Pulau Tenggol, and eastward of Pulau Aur; from the latter, steer for Gunong Palali (Barbukit), so as to allow for the southerly current setting across the strait; but *see also* Route 1,315 (a).

CAUTION. Approaching Pulau Tioman at night or in thick weather, a good look-out should be kept and allowance made for the current setting to the south-westward, as vessels have several times been found close to the north end of that island when the reckoning has placed them well to the eastward of it.

(b) South-West Monsoon.—Keep the western shore of the Gulf of Thailand (Siam) aboard, passing inside the Perhentian and Redang islands, Pulau Kapas and Pulau Tenggol. Southward of Pulau Kapas, keep in-shore to avoid current, passing inside the Tioman group, Pulau Sri Buat (Siribuat) and Pulau Sibu; thence proceed to Singapore strait, taking advantage of the tidal streams and the land and sea breezes which prevail during settled weather in this monsoon.

Note.—The in-shore channel extending from Pulau Sibu to Pulau Sri Buat (Siribuat), and formed by a chain of islands and rocks parallel to the mainland, is a good and safe one, having but few hidden dangers, and good anchorage all the way through. *See* China Sea Pilot, Vol. 1.

Route 1,312. Saigon to Singapore

(a) North-East Monsoon.—From Saigon, when off Cap St. Jacques, shape a course to pass eastward of Pulau Condore, and thence direct to make Pulau Aur. From Pulau Aur to Singapore proceed according to directions as from Hong Kong *(Route* 1,315 *(a)).*

(b) South-West Monsoon.

(i) Direct route.—*See* (ii) below for, probably, the better route.

From Saigon many good passages have been made by keeping the Cambodia coast aboard as far as the Brothers, westward of Pulau Condore or Pulau Obi, and then crossing the Gulf of Thailand (Siam) with a strong north-westerly wind until the Malay coast is reached. From Pulau Kapas (*Lat. 5° 10′ N.*), follow the directions given in Route 1,311 (b) from Bangkok to Singapore in this monsoon.

(ii) Alternative route.—The passage eastward of Great Natuna island is, however, considered to be, generally speaking, better, especially for large vessels, and is as follows:—

After leaving Saigon, and being off Cap St. Jacques (Cape St. James), steer to the south-westward until the regular monsoon breaks the vessel off to the south-east. This may be accomplished by taking every advantage of the north and north-east winds, which frequently blow at night, and in some parts of the day, within a short distance of the coast. These local winds often carry vessels 40 or 50 miles south-westward of Pulau Condore without any interruption.

While standing to the south-eastward the full strength of the north-easterly current will be met with about the Charlotte bank; it gradually decreases and becomes slightly favourable when north-eastward of the Great Natuna island. In this locality south-easterly and easterly winds will generally be met with, and fast sailing vessels frequently pass through the channel between Soebi (Subi) and Midai islands (China Sea Pilot, Vol. II.), and into Singapore strait. There is now a light on Soebi kechil, on the south side of the channel between Soebi islands and Great Natuna island; this channel is safe for all classes of vessel.

Strong westerly winds, with rain, frequently blow during the early part of this monsoon, and from this cause or from proceeding 2° or 3° eastward of Great Natuna island with scant southerly winds after leaving the Cambodia coast, dull sailing vessels have often made the northern part of Borneo about the meridian of Tanjong Sirik. When this is the case, make for Api passage *(see* Route 1,302 (a) (iii).)

keeping the north-west coast of Borneo aboard from Tanjong Api southward until the Boeroeng eilanden are reached. This will be accomplished without difficulty, for strong land and sea breezes prevail, and the current is weaker near the coast. (Many vessels, through leaving the coast of Borneo too soon, have fetched no higher than Pulau Aur or Pulau Tioman).

Leaving the Boeroeng eilanden, pass either northward or southward of the Tambelan islands. Should the wind be scant from the south-west after leaving these islands, endeavour to make Mapor (Panjang) eiland, off the east side of Bintan eiland.

Notes.—The current in the offing runs strongly to the northward and through Api passage. Vessels coming through this passage should keep the northern side, when possible, towards Meroendoeng (Merundung) eiland, and not shoal at night to less than 13 fathoms ($23^{m}8$) water on the southern side between Tanjong Datoc and Tanjong Api; the latter point has shoals steep-to at 1½ miles off, but beyond that distance there is not less than 5 fathoms ($9^{m}1$) between it and Tanjong Datoc. Vessels should be ready to anchor in the passage or off any other part of the coast, as the tidal streams are greatly influenced by the current, which often changes without warning.

Route 1,313.—*Reserved as spare.*

(iii) ROUTES FROM PORTS IN CHINA

Route 1,314. China (or Japan) to the Indian ocean

This route gives a general summary of the principal passages from China to the Indian ocean most frequently used by sailing vessels. Detailed directions for these passages will be found elsewhere in this book as follows:—

Passages through the China sea southward bound.—In (b) below and Route 1,315, Hong Kong to Singapore; Route 1,325, Shanghai to the southward along the China coast; and Routes 1,330, 1,331, 1,332 and 1,334 from Manila.

Passages from Singapore.—In Routes 1,203 to 1,209 inclusive, and in Chapter II. of Section C., Part II.

Passages through the Eastern archipelago.—In Chapter II. of Section C., Part II.

Passages from the Eastern archipelago into the Indian ocean.—In Routes 1,203 to 1,211 inclusive.

(a) General summary of routes from China (or Japan) to the Indian ocean.—There are three principal routes as follows.

(i) The Western route.—This passes through the China sea westward of the Philippine islands and of Borneo to Soenda (Sunda) straat through the Eastern Archipelago either direct, or via Singapore; the selection of which alternative to follow depends to a great degree on the final destination to be reached.

(ii) The Eastern route.—This route passes eastward of the Philippine islands, and then via Djailolo passage, or the Molucca sea into the Ceram and Banda seas. Thence it continues to Ombai straat, or to one of the central passages (Alas, Lombok or Bali straten). If bound to Torres strait the passage from the Banda sea would be as described in Route 1,316, Hong Kong to Torres strait, and Port Darwin.

(iii) The Central route.—This route passes westward of the Philippine islands but eastward of Borneo through Macassar strait, and thence to one of the central passages (Alas, Lombok or Bali straten). Alternatively a vessel, after leaving Macassar strait, may stand westward through the Java sea to enter the Indian ocean through Soenda straat.

Note.—Of the three routes above, (i) and (iii) are those usually employed by vessels from southern ports of China (Hong Kong, etc.); (iii) for vessels from Manila, southern Philippine ports, or eastern ports of Borneo, southward bound; and (ii) for vessels from northern ports of China (Shanghai, etc.), or from Japan; also from southern ports of China in the strength of the South-West Monsoon.

(b) Seasonal variation of the routes from ports in Southern China.

(i) North-East Monsoon (September to February).—Pass between Macclesfield bank and the Paracel islands and reefs, then about 60 miles eastward of Pulau Sapatu (borrowing to the eastward where the winds are more favourable), and between Anamba and Natuna islands to Banka straat or Gaspar straten; thence continue to Soenda straat. *See* (7) (a) and (b) of the Index to Chapter II. of Section C., Part II. on page 250.

(ii) South-West Monsoon.

March, April or the early part of May.—China sea route.—Leaving the coast of China in these months, stand over to the coast of Luzon and proceed through Palawan passage, along the coast of Borneo, through Api passage, past Pengiki besar eiland and through Karimata straat; then close round Noordwachter (North Watcher) and direct to Soenda straat. On this route easterly winds, without calms, but with fine weather, and a smooth sea are likely to be experienced.

End of April or beginning of May.—Alternative to the above.—Macassar strait route.—Leaving China at this time, an alternative route is to stand towards Macclesfield bank and then follow the Central route *(see (a) (iii)* above) as follows:—

From near Macclesfield bank, stand south-eastward to join the Central route at Verde Island passage or Mindoro strait. *See* (9) (a), (b) and (c) of the Index to Chapter II. of Section C., Part II. on page 251.

Middle of May to end of July.—Eastern route.—Leaving China in these months, cross the China sea, pass through Balintang channel to join the Eastern route. *See* (8) (a), (b) and (c) of the Index to Chapter II. of Section C., Part II. on page 250.

August.—China sea route.—Leaving China in August, stand towards Hainan island, cross the Tongking gulf, and work down the coast of China with the land and sea breezes, as far as Cape Varella or Cape Padaran. Then cross to the coast of Borneo, tacking as necessary to clear any reefs, and work along that coast and through Karimata or Gaspar straten to Soenda straat. *See* Chapter II. of Section C., Part II.

Route 1,315. Hong Kong to Singapore

(a) North-East Monsoon.—October to March.—After clearing the land from Hong Kong, steer to pass between the Macclesfield bank and the Paracel reefs, and thence to pass eastward or westward of Pulau Cecir de Mer and the Catwick islands. Thence, passing westward of Charlotte bank and the Anamba islands, steer to make Pulau Aur.

Departing from Pulau Aur, bring it to bear about 360° or less when disappearing; if the weather is clear, Groote Bintanberg and Pulau Aur may be seen together, but this seldom happens. The foot of the eastern slope of Kleine Bintanberg in line with the western summit of Groote Bintanberg, bearing 182°, leads nearly one mile eastward of North patch.

In making the entrance at night, if the position be known, stand on boldly for Horsburgh light, making allowance for the set of the stream; and when the light is seen, steer so as to pass from about one to 2 miles northward of it.

In slightly hazy weather, with Pulau Aur disappearing astern, bearing 360° or less, steer a course between 192° and 204° which may be requisite if the north-easterly-going stream is setting out of Singapore strait. The depths will decrease regularly in steering southward, and the low land will probably be seen to the westward when in depths of from 18 to 20 fathoms ($32^{m}9$ to $36^{m}6$); if so, coast along it at a distance of about 13 miles, until Bukit Twatow is sighted. If in any doubt about the position, or a depth of from 10 to 12 fathoms ($18^{m}3$ to $21^{m}9$) be obtained, either haul off the land or anchor.

Having made the entrance to Singapore strait, proceed as described in Route 1,127 (1) (a) (i) and (ii).

Note.—In March, during the latter part of this monsoon, the winds are steady from the eastward, the weather settled and the current weak. In April, the prevailing winds are also from the eastward, but are much lighter and accompanied with calms and squally weather; from the latter end of this month to about the middle of May the monsoon gradually breaks up.

CAUTION. Should the weather be thick, and a fresh breeze blowing, when near Pulau Aur, round to under its lee, and wait a convenient time to bear up for the strait. The current between this island and the east point of Bintan eiland sets about south-south-east, by which it often happens that vessels leaving Pulau Aur steer too much to the southward, and are swept with the current and the easterly-going stream coming out of Singapore strait so far to the leeward of Bintan eiland that they have been obliged to proceed round it, and come up through Riouw straat. *See* Route 1,125.

(b) South-West Monsoon.

(i) March, April, and May.—From the southern ports of China, or from Manila, make for the passage between Palawan island and the off-lying reefs, at a point in about lat. 11° 30′ N., long. 118° 30′ E., and thence make south-westward through the Palawan passage, and then on a mean course roughly parallel to the coast of Borneo along the pecked line shown on the charts.

Pass through one of the passages through the South Natuna islands, and stand across to the entrance to Singapore strait. Thence proceed as in Route 1,127 (1) (a) (i) and (ii).

Notes.—Approaching Singapore strait make sure of your land-fall. Keep well to the southward before closing Bintan eiland, so as to allow for the current which sometimes runs to the northward at the rate of 2 knots.

The navigational notes regarding Palawan passage given at the end of Route 1,304 are applicable whether bound northward or southward.

(ii) Alternative route (Early part of the monsoon).—If the wind should be to the south-westward on leaving Hong Kong, a good passage may occasionally be made in the early part of the monsoon by standing to the south-eastward as far as lat. 15° N. and long. 115° 30′ E. Thence pass south-westward of the Macclesfield bank, to Pulo Sapatu or to Cape Padaran, and cross the Gulf of Thailand (Siam) to Pulau Aur and thence to Singapore, as in (a) above.

(iii) August to October.—After leaving Hong Kong stand toward Hainan, which will be often fetched without tacking, as the wind frequently blows for days together from the south-east or eastward in that part of the China sea; from thence cross the Tongking gulf to the Cochin-China coast. Land and sea breezes and smooth water generally prevail close to that coast, for which reason work down as close to the shore as possible, taking advantage of every slant of wind, but being careful not to get too far off the land. It is sometimes possible to get as far to the southward as Cape Padaran, or Mui Dinh, in this way, but generally after passing Cape Varella the monsoon is found blowing very fresh, with frequent hard squalls out of the Gulf of Thailand (Siam), rendering it impossible to work much to windward.

From Cape Varella, or from Cape Padaran if a vessel has been able to fetch it, stretch away to the southward—making a tack if necessary, to weather the West reef (*Lat. 8° 51′ N., Long. 112° 13′ E.*) of the London reefs or other shoals—till the coast of Borneo is reached, along which work, and pass out through any of South Natuna channels, and proceed to Singapore as described in (b) (i) above.

Route 1,316. Hong Kong to Torres strait and Port Darwin

(1) To TORRES STRAIT.

(a) Usual route.—Steer across the China sea from Hong Kong to make Lubang island or Cape Kalavite, and enter the Sulu sea through Mindoro strait *(See Route* 1,314 and 1,155) or, by passing east of Lubang island, through Verde Island passage *(See Route* 1,138 (3) *for description)*, and Tablas strait.

In either case, having passed through Cuyo East pass eastward of Sombrero rocks, proceed southward through the Sulu sea to and through Basilan strait into the Celebes sea *(see Route* 1,142 (1) *and* (2), *and Caution)*. Cross the Celebes sea to Bangka straat off the north-east point of Celebes, passing through it into the Molucca sea, and continue southward to enter the Ceram sea between the Soela eilanden and Obi Major eiland.

Cross the Ceram sea and pass through Manipa straat *(See Route* 1,153 (1)) into the Banda sea. Having cleared Manipa straat, steer south-eastward to pass between Kai (Kei) and Tanimbar eilanden, leaving Manoek (Manuk) eiland to northward or southward as convenient.

Having passed Tanimbar eilanden, the direct route to Torres strait passes southward of Aroe eilanden and past Kaap Valsch, but this is not recommended owing to the dangers south-westward and southward of the Aroe eilanden, and to the chain of known and unexamined dangers lying westward from Kaap Valsch almost as far as the meridian of 134° E. Instead, a vessel is recommended to keep to the south-eastward from Tanimbar eilanden to cross the meridian of 134° E. in about lat. 9° S., and proceed thence to Torres strait.

Note.—The following alternative route for steamships from the Ceram sea to Torres strait may prove useful to sailing vessels also, especially those of small size.

In order to escape the South-East Monsoon during the months of July and August, when it blows strong and raises a high sea in the Arafura sea, some steamships, after passing Obi Major eiland, have taken the passage north of Ceram eiland, the Kai (Kei), and Aroe eilanden, and passed Kaap Valsche at a distance of 30 miles, as mudbanks extend to a great distance from the cape. This passage has the advantage of smooth water, but is a little longer and less well known than the passage through the Banda sea.

(b) Alternative route.—Take (2) (b) below.

(2) To PORT DARWIN.

(a) November to April.—Follow (1) (a) above as far as Manipa straat and then steer to the south-south-eastward to pass eastward of Schitdpad eilanden and between Damar eiland and Teoen (Teun) eiland; thence pass between Sermata eiland and Babar eiland into the Arafura sea. Proceed across the Arafura sea to make Cape Fourcroy on the south-west of Bathurst island, avoiding Flinders and other shoals near the route; thence proceed to Port Darwin. *See* Australia Pilot, Vol. V. for a description of the dangers in the approaches.

(b) April to October.—Steer across the China sea and pass through the Balintang channel into the Pacific ocean. Thence proceed south-eastward to pass either side of the Palau islands, and make easting in the equatorial counter current between

lat. 4° N. and 8° N., until able to fetch through the Solomon islands with the South-East Trade crossing the equator in about long. 158° E. After passing through the Solomon islands, steer westward to Torres strait via the Great North-east channel (*See* Route 1,266) (a) (i)) and thence to Port Darwin.

Note.—From the Palau islands some navigators take the passage known as St. George channel (*See* Route 1,317 (a) (i) Note) instead of passing through the Solomon islands or again, the Pioneer channel, between New Ireland and the Solomon islands, may be used.

Route 1,317. Hong Kong to Sydney

(a) South-West Monsoon (April to September).—Of the four routes described below (i) and (ii) pass into the Pacific northward and southward respectively of the Philippine islands, and thence eastward of Australia; (iii) and (iv) lead through the Eastern archipelago to the Indian ocean, and thence westward and southward of Australia.

(i) Northward of the Philippine islands.—Take Route 1,316 (2) (b) to the Coral sea, passing through the Solomon islands or, if preferred, either through Pioneer channel, between New Ireland and the Solomon islands, or through St. George channel (*See Note below*). Thence steer southward to join Route 1,287, Thursday island to Sydney in about lat. 15° S., long. 156° E.

Note.—St. George channel.—As stated in the Note under Route 1,316 (2) (b), some navigators prefer this channel, which separates New Ireland from New Britain, and is apparently free from dangers, to the channels through the Solomon islands. The New Ireland side may be approached within a short distance, but there are reefs on the New Britain side extending about a mile from the shore.

(ii) Southward of the Philippine islands.—Take Route 1,316 (1) as far as the Celebes sea, and thence steer to pass into the Pacific ocean southward of Mindanao, between Sarangani island and Kawio eilanden. Thence make easting in the equatorial counter current as in Route 1,316 (2) (b) and join (i) above southward of the Solomon islands or St. George channel.

(iii) The "Eastern route."—Take Routes 1,151, 1,152 and 1,153, described in sub-section B. (ii) of Chapter II. of Section C., Part II., on page 272. On reaching the Indian ocean proceed as described in Route 1,207 (a) or (b) to round Cape Leeuwin, and join Route 1,091.

(iv) The "Central route."—Take Routes 1,155, 1,156, 1,157 and 1,158 as described in sub-section B. (iii) of Chapter II. of Section C., Part II., on page 273. Thence proceed as in (iii) above.

(b) North-East Monsoon (October to February).

(i) Via Torres strait.—Take Route 1,316 (1) to Torres strait and thence Route 1,287 to Sydney.

(ii) Via Soenda straat and westward of Australia.—Take Route 1,314 (b) (i) to Soenda straat and thence take Route 1,207 (a), but join Route 1,091 (1) (b) after entering the westerly winds.

Route 1,318. Hong Kong to Manila

(a) North-East Monsoon.—In the North-East Monsoon, make for the coast of Luzon at about Piedra point, Cape Bolinao, lat. 16° 18′ N. The current sets strongly to leeward, but decreases near Luzon. From the latitude of Piedra point, steer southward for Manila bay, giving the coast dangers a wide berth.

(b) South-West Monsoon.—In the South-West Monsoon, take every advantage of the wind shifting south-eastward or eastward to make southing. From Macclesfield bank Manila is easily fetched; indeed, did not the wind back from south-west to south and south-south-east, Manila might be fetched on one tack. If passing to windward of Scarborough shoal caution is necessary on account of the current setting to leeward. With a southerly wind, make Lubang island and the land southward of Manila bay.

Pratas reef. CAUTION. The Pratas reef, lying in the route between Manila and Hong Kong, is a serious danger, especially in the North-East Monsoon, when strong gales and thick clouds are sometimes prevalent for weeks together; and as, in this monsoon, vessels generally approach the reef from the south-eastward (but *see* directions below), the greater number of wrecks have occurred on this side.

Tide rips.—At distances of from 20 to 50 miles north-westward to north-eastward, through north, of Pratas reef, during the times of various searches being made for reported shoals, the currents in the neighbourhood were found to be exceptionally strong, and tide rips were frequently observed, which occasionally appeared like breakers.

Directions.—During the strength of the monsoons, vessels should always endeavour to pass to leeward of Pratas reef, on account of the invariable set of the current to leeward; soundings give no warning of a vessel's approach to it, and the weather is frequently thick and hazy in this vicinity. The safest quarter to make the reef from is the western, as the island is on this side and the currents set in a north-east or south-west direction, according to the prevailing monsoon; approaching the reef a vessel should be conned from aloft, as with the sun in a favourable position the bottom can be seen in a depth of 10 fathoms ($18^{m}3$).

Anchorages.—Although Pratas reef is steep-to in most parts, there are several spots where, in case of necessity, a vessel might find anchorage outside the breakers; particularly on the west side, abreast the middle of the north and south channels over the sunken part of the reef, and at the distance of about 2 and 2½ miles, respectively, on either side of the island. At each of these spots there is good anchorage in the North-East Monsoon, in 20 to 10 fathoms ($36^{m}6$ to $18^{m}3$), but the position abreast the south channel is considered the better of the two, the sunken reef at this part being deeper and the bottom more even than in the channel north of the island. There is anchorage in about 20 fathoms ($36^{m}6$), coral and clay, at about one mile westward of the west end of the island. A vessel of light draught might even anchor in safety on the reef in the middle of the south channel entrance, in 3½ fathoms ($6^{m}4$) at low water, or cross it and take up a berth inside the lagoon in 10 fathoms ($18^{m}3$) fine sand.

Route 1,319. Hong Kong to Yokohama, or Nagasaki

(1) To YOKOHAMA.

(a) North-East Monsoon.

(i) Usual route.—From Hong Kong work up the coast of China as far as Breaker point, taking advantage of the fact that the wind hauls to the northward at night and to the eastward during the day. From Breaker point stand across for the south end of Formosa and work up on the eastern side of that island; a southerly set will be felt until reaching Garan bi, after passing which the Kuro shio will be experienced setting to the northward. Continue northward to the westward of Nansei shotō as described in (ii) below.

(ii) Towards the end of the monsoon.—Towards the end of the North-East Monsoon stand across the China sea until near the coast of Luzon, where the wind will be more easterly or even south-easterly, when tack and stand north-north-eastward along the east coast of Formosa, and westward of all the groups of Nansei shotō, with generally a favourable current. Thence pass through one of the channels southward of Ōsumi kaikyō, and from 50 to 80 miles off the south coast of Japan in the strength of the Kuro shio, making the land about Ōmai saki light, to enter Uraga suidō.

(b) South-West Monsoon.—Run up the China coast as far as Tung yung, thence steer to pass through the Tokara guntō southward of Akuseki shima (in preference to Ōsumi kaikyō, where dense fogs will probably be found, whilst further seaward in the warm waters of the Kuro shio the atmosphere is bright and clear). The course along the south coast of Japan is the same as in the North-East Monsoon. *See* (a) (ii) above.

(2) To NAGASAKI.

(a) North-East Monsoon.—Proceed as in (1) (a) (i) or (ii) until north of Formosa, after which continue as direct as navigation permits.

(b) South-West Monsoon.—Take (1) (b) above to Tung yung and thence take a direct course to Nagasaki.

Route 1,320. Hong Kong to the northward to ports on the coast of China

There is no difficulty in making this passage in the South-West Monsoon, but in the North-East Monsoon a sailing vessel should be in good condition for meeting with rough weather and for carrying sail.

(a) North-East Monsoon.—Make the passage northward by either of the following routes.—

Pass eastward of Formosa so as to benefit from the Kuro shio current, and the diminished strength of the North-East Monsoon; the heavy short sea of the Formosa strait will also be avoided. This passage is described in (i) below.

Alternatively, work up the coast of China taking advantage of every favourable change of wind and tidal stream, and anchor whenever conditions are unfavourable, and this action is possible. This route is described below in two parts; (ii) to ports southward of, and (iii) ports northward of Min kiang (*Lat. 26° 05′ N.*).

(i) Route eastward of Formosa.—Leaving Hong Kong, work along the China coast as far as Breaker point (*Lat. 22° 56′ N., Long. 116° 30′ E.*) to maintain as long as practicable the advantage of the land wind at night, of smoother water, and of the east-going tidal stream out of the deep bays, which will generally be under the lee when on the starboard tack. There are numerous convenient anchorages should the wind blow too hard to make way. *See* China Sea Pilot, Vol. III. Keep within 10 miles of the land, to avoid being carried southward by the monsoon drift current whilst standing off-shore; but as this cannot be done at night without risk, anchor, if possible, in the evening, and weigh between midnight and 0400, when the wind, generally being more off the land, allows a good board on the off-shore tack to be made. From Breaker point stand across to the southern end of Formosa, as by passing eastward of that island the heavy short sea of Formosa strait is avoided, as well as the constant southerly current.

After rounding the southern end of Formosa, off which there is generally a troublesome sea, make short tacks, if requisite, and keep within the influence of the Kuro shio.

The North-East Monsoon does not blow with its full strength on the east coast of Formosa, but strong gales are often experienced 20 miles to the eastward. If the wind declines in strength, with less sea on the western board (particularly between 0900 and 1500 or up to sunset), it is advantageous to hug the coast as far as prudent; but caution is requisite, for the coast is mountainous and steep-to, and sudden loss of wind accompanied by swell might be attended, if followed by calm, with imminent danger, as there are no harbours. Stronger winds, with much rain are met as advance is made eastward during the North-East Monsoon. If an off-shore course is maintained whilst eastward of Formosa a constant succession of bad weather may be expected, with strong winds and a heavy sea.

Towards the close of the North-East Monsoon, and still later, it is preferable to cross over towards Luzon than to beat up to Breaker point against fresh north-east breezes; therefore stand off on the port tack, clean full to the south-eastward and pass through the south-westerly current quickly, and on nearing Luzon, as the wind becomes more easterly (sometimes even from south-east), tack north-north-eastward with a strong favourable current and arrive eastward of Formosa in less time than it would have taken to fetch Breaker point by keeping along the coast of China.

Having weathered the northern end of Formosa, it is still advisable to keep well eastward, and not approach the coast of China until the parallel of 30½° N. is gained. In case of being driven westward, take advantage of the tidal streams through the southern part of the Chusan archipelago; but *see* (iii) below.

(ii) Northward up the coast of China as far as Min kiang.—General notes.—Bound for Swatow, Amoy, or the ports between that place and Min kiang, there is generally difficulty in getting round Breaker point, for the tidal stream there is of no assistance. Advantage must therefore be taken of the wind, which will probably draw off the land after midnight, when, by being in-shore, a good board can be made, and possibly Good Hope cape or Piao chiao reached. For Haimung (Haimun) bay and Hope bay anchorages, *see* China Sea Pilot, Vol. III.

Having reached Good Hope cape, the north-east-going stream assists a vessel to round it, and the ebb out of Han river is a weather tide; if not going inside Namoa island, endeavour to get along the southern side of the island, clearing Kaipan and Tamsui rocks, and anchor in South bay, should the weather be too bad to proceed. Both streams are strong off Three Chimney point, and also off Jokako point (*Lat. 23° 36′ N., Long. 117° 27′ E.*) in rounding which take the first of the north-east-going stream and the port tack.

Further northward, about Rees islands, the north-east-going stream with strong winds causes a very uneasy sea. Red bay and Tingtai bay are good stopping places for small vessels; the latter should be preferred, though at the loss of 2 or 3 miles, to anchoring in an exposed position in Amoy harbour entrance, as when north-east winds freshen there during the rising tide they are generally accompanied by a mist, which obscures the entrance, and the tidal stream makes it difficult to get to sea.

Liau lu and Huitow (Hu i tau) bays are northward of Amoy, and both afford good shelter; Chimmo bay is not so good. The current in the monsoon overcomes the tidal streams; and advantage must be taken of every slant of wind, bearing in mind that it is likely to draw off the land after midnight, and in the event of anchoring for shelter this is the time to start, should the wind moderate; by waiting for daylight vessels lose their offing, and have to make an off-shore board at a loss. The fog is at times thick, and soundings must be taken, the bottom generally changing from sand to mud as the shore is approached. There is fair anchorage under Pyramid point (*Lat. 24° 53′ N., Long. 118° 59′ E.*), but not so good as that under South Yit; and if the vessel is heading north or anything east of it, the ebb from Meichow wan (Meichen sound) is of assistance.

The most difficult part of the passage is from Lam Yit island, or the southern end of Hai tan strait to Pai chuan lich tao (Pai kuen) islands; sailing vessels should keep outside Hai tan strait, and stretch over to the north-western coast of Formosa, where they have the advantage of a weather tide.

(iii) Up the coast of China northward of Min kiang.—General notes.—On this part of the coast, the indraught during the rising tide must be considered.

Bertha cove in Tung yung island is a good anchorage *(See* China Sea Pilot, Vol. III.), but northward of this sailing vessels (unless under 12 feet ($3^{m}7$) draught) must keep off the coast in deep water. The tidal streams afford but little assistance until the Chusan archipelago is reached; the north-east-going stream causes an uneasy sea in the shallow water, while the south-west-going stream has too much southing, unless the wind is well from the eastward. Namki and Piki shan islands afford good shelter.

The route through the southern channels of Chusan archipelago is not usually taken by sailing ships. In working through the northern part of the archipelago, advantage can be taken of the tidal streams.

The eddy tidal streams generally carry vessels clear of the large islands, but caution is required to prevent being set in amongst detached rocks.

(b) South-West Monsoon.—General Notes.—There is no difficulty in making this passage, but northward of the Min kiang it is often as late as May or June before the South-West Monsoon sets in, and the north-easterly winds prevail for nine months of the year; therefore, before June and after August, the passage is likely to be tedious. In-shore, the winds are generally light and the sea smooth, but at a distance from the land strong north-easterly winds with considerable sea are frequent, the high swell appearing to indicate a prevalence of those winds. In the offing also, the current usually sets south-westward, and during a calm 20 miles outside the Tai (Tae) islands its rate has been observed to be 2 to 3 knots; this current was a surface current 16 feet ($4^{m}9$) in depth.

Route 1,321. Hong Kong or Manila to North America and Panama

In all cases take Route 1,319 (1), Hong Kong to Yokohama, to join routes across the Pacific ocean off Uraga suidō as follows:—

(1) To COLUMBIA RIVER, VANCOUVER or PRINCE RUPERT.—Join Route 1,336, Yokohama to these ports.

(2) To SAN FRANCISCO.—Join Route 1,337, Yokohama to San Francisco.

(3) To PANAMA.—Follow Route 1,337 as far as about long. 150° W. and then proceed as directly as possible.

Route 1,322. Hong Kong or Manila to Valparaiso or other port of South America

(a) South-West Monsoon.

(i) Via Bashi channel.—In this monsoon sailing vessels are recommended to take Route 1,321 past Yokohama and eastward thence before standing to the southward.

Maury recommends vessels to follow this route as far as long. 152° E., then to cross the equator in long. 172° E., and pass either east or west of New Zealand into the westerly winds; Horsburgh and Becher recommend vessels to get into long 165° to 170° E. before they stand across into the trades.

It is recommended that Route 1,260 or 1,261 from Sydney should be joined at a convenient point.

(*ii*) *Via San Bernardino strait.*—The Pacific ocean may also be reached in the South-West Monsoon by San Bernardino strait as described below. When clear of the strait, make easting to join (i) above as convenient; or steer to the north-eastward until in the westerlies and then make easting as in (i) above.

Passage to, and through, San Bernardino strait, west to east.—Pass through Verde Island passage *(See Route* 1,138 (3) *for description)* and thence to a point southward of Marinduque island. From this position steer to make the north-west point of Masbate island, to avoid being embayed with a south-west wind in Nabasagan bay on the west coast of Burias island. A mid-channel course should be steered between Burias and Masbate islands, and when the south-east point of Burias island is passed steer a north-easterly course to pass north of Tikao island, giving San Miguel island, off the north point of Tikao island a good berth on account of the strength of the tidal streams near it.

If the wind is settled, steer for San Andres island, the north-western of the Naranjo islands, and thence pass midway between Kapul island and the islands off the south-east point of Luzon, proceeding out of the strait between San Bernardino islets and Biri island off the coast of Samar.

If the south-west wind is not settled, it is well to remain at San Jacinto until it is, lest calms or light winds should leave the vessel at the mercy of the tides in the strait. The best time for leaving the port is at half-flood, for then a vessel is likely to get the first of the ebb when she is near Naranjo islands. In steering a course, attention should be paid to the set of the tide.

Note.—If carried into the neighbourhood of Kalantas rock, it would be well to make for the coast of Luzon, where anchorage may be had, or to anchor on the bank in good time. The navigation of the strait requires great care, and an anchor should always be ready to let go.

(b) North-East Monsoon.—Take Route 1,316 (1) as far as the Celebes sea, and then take one of the following routes.

(i) Direct to the Pacific ocean.—Cross the Celebes sea to enter the Pacific ocean southward of Mindanao, and then steer to pass northward of New Guinea and continue eastward between lats. 2° N. and 4° N. as far as the Gilbert islands. Thence steer to the south-eastward into the westerlies to join Route 1,260 or 1,261.

(ii) Via Torres strait.—Continue on Route 1,316 (1) to Torres strait. After clearing Torres strait by Bligh entrance, continue along the southern coast of New Guinea and the Louisiade archipelago until far enough east to cross the trades into the westerly winds and join Route 1,260 or 1,261.

Route 1,323 and 1,324.—*Reserved as spare.*

Route 1,325. Shanghai to the southward along the China coast

(a) North-East Monsoon.—After passing the Ma an lieh tao (Saddle group) and Video, the easternmost island of the Chusan archipelago, steer a good offshore course, passing outside the outer islands, giving them a good berth at night, and closing the land to obtain the position, by day, if no astronomical observations are obtained; for thick, hazy, or rainy weather may always be expected.

(b) South-West Monsoon.—Although the constant adverse current makes this a tedious passage, a vessel of moderate sailing qualities can do it, as the South-West Monsoon is not steady in its direction, and land and sea breezes prevail.

CAUTION. Fog is frequent in the early part of the season, and renders caution necessary; it sometimes lifts near the land.

Route 1,326. Shanghai to Cape of Good Hope and ports in the Indian ocean

(a) North-East Monsoon.—Take Route 1,325 (a) towards Hong Kong and pick up Route 1,314 (b) (i), China to the Indian ocean, proceeding either via Singapore or direct through the Eastern archipelago. *See* the remarks at the beginning of Route 1,314, quoted above.

(b) South-West Monsoon.—Steer direct for a position in lat. 15° N., long. 132° E., eastward of the Philippine islands, to pick up Route 1,340 (b), Yokohama to the Indian ocean.

Route 1,327. Shanghai to Japanese ports

(1) To NAGASAKI.

CAUTION. *See* China Sea Pilot, Vol. III., for information respecting Socotra rock (*Lat. 32° 07′ N., Long. 125° 11′ E.*) which lies on this route.

(a) North-East Monsoon.—On leaving the Yangtse, with the wind eastward of north, make northing at once, taking advantage of the tidal streams. As advance is made to the northward, the wind usually draws round through north to north-westward. Make allowance for the current, which then sets to south-eastward or eastward.

(b) South-West Monsoon.

(i) March to June.—During the easterly and south-easterly winds which prevail from March to June, make easting or southing, even when a fair wind occurs, for it is sure to be of short duration; and the tendency of the prevailing wind being to keep a vessel on the starboard tack, there is always a probability, during these months, when the current sets to the north-eastward, of being set towards the Korean archipelago. When baffling winds, and thick, rainy and squally weather are met in the vicinity of Me shima (Danjo guntō), Tori shima and Goto rettō, and the position is uncertain, make these islands in daylight.

(ii) After June.—With a steady South-West Monsoon and a fair wind, steer from the entrance of the Yangtse a course to pass between the Danjo guntō, and Tori shima.

CAUTION. The direct course from the Amherst rocks leads midway between Tori shima and Goto rettō; but it should *not* be taken, as the branch of the Kuro shio, which sets through Korea strait, has to be crossed, and vessels have been carried by it even northward of the southern end of the Goto rettō.

(2) To YOKOHAMA.

(a) North-East Monsoon.—If the wind on leaving is eastward of north, as it frequently is in this monsoon, make northing; and when the wind draws round to the north-westward, steer as directly as possible round the south end of Japan; and thence in the strength of the Kuro shio current.

(b) South-West Monsoon.—Make easting, or southing, as directed in (1) (b), above, and thence proceed direct round the south end of Japan as in (a).

Route 1,328. Shanghai to ports in North America

Take Route 1,327 (a) or (b) to Yokohama, and thence take Route 1,336 to Columbia river, Vancouver or Prince Rupert, or Route 1,337 to San Francisco.

Route 1,329.—*Reserved as spare.*

(iv) ROUTES FROM MANILA

For route from Manila to ports in North or South America, see Routes 1,321 *and* 1,322.

Route 1,330. Manila to Singapore

All seasons.—Steer to pass northward of the central dangers of the China sea for Pulau Sapatu; thence proceed direct to Pulau Aur and to Singapore. *See* directions in Route 1,315 (a), Hong Kong to Singapore.

Route 1,331. Manila to Saigon

(a) North-East Monsoon.—Take a direct passage across the China sea, allowing for the current which sets with the wind.

(b) South-West Monsoon.—During this monsoon sailing vessels will find the voyage long and trying whichever route they adopt. The following route has been recommended:—On leaving Manila bay take the Verde Island passage, pass down the east side of Mindoro island and the west coast of Panay island, cross the Sulu sea passing out by Balabac strait, and work down the north-west coast of Borneo to make westing; then cross the China sea passing eastward of the Natuna islands.

Route 1,332. Manila to Hong Kong or Amoy

(a) North-East Monsoon.—There is a choice between two routes in this monsoon, westward or eastward of Formosa, if bound to Amoy; to Hong Kong proceed as in Route 1,304 (1) (a) (iii).

(i) Westward of Formosa.—Keep near the coast to Cape Bojeador, and then work northward to Garan bi (*Lat. 21° 54′ N., Long. 120° 51′ E.*), and thence along the south-west and west coast of Formosa until able to stand across Formosa strait to Amoy.

See Cautions and Notes regarding—Extension of shoals on western side of Formosa; Pratas reef; Luzon strait; and Formosa strait, under (b) below.

(ii) Eastward of Formosa.—If the monsoon is well set in, it might be advisable to stand eastward north of Luzon, and work to the northward in the Kuro shio current, passing eastward of, and round the north of, Formosa. Thence, allowing for current steer to make the China coast northward of the destination.

(b) South-West Monsoon.—Proceed direct, making allowance for a lee current.

CAUTION. *Western side of Formosa.*—Almost the entire west coast of Formosa is extending seaward and new shoals are continually arising; this is especially the case between Anpin kō and Jaian kō. Therefore when navigating along this coast give it a wide berth, bearing in mind that there is always a current setting inshore.

Pratas reef.—*See* Caution and Notes under Route 1,318.

Notes.—*Formosa strait.*—The crossing of the strait is attended with considerable trouble at all times of the year, on account of the strong, variable and sometimes opposite currents setting across the track. This is particularly noticeable at the change of monsoons. In the southern and western part of the strait, a strong drift current setting to leeward (in both monsoons) must be allowed for. *See* China Sea Pilot, Vol. III.

Luzon coast.—*Working along.*—*See* Notes under Route 1,304 (1) (a) (iii).

Route 1,333. Manila to Iloilo or Cebu (Sebu)

(1) To ILOILO.

(a) North-East Monsoon.—Pass through the Verde Island passage and Tablas strait, and continue southward along the west coast and round the south end of Panay island to Iloilo.

(b) South-West Monsoon.—Proceed as in (a) as far as Dumali point (*Lat. 13° 07′ N., Long. 121° 34′ E.*), and then steer to pass south of Simara island and between Tablas and Romblon islands. Thence pass through Jintotolo channel between Jintotolo and Zapatos islands, and then, turning southward, proceed along the east coast of Panay to Iloilo.

(2) To CEBU.

Both Monsoons.—Take (1) (b) above as far as Jintotolo island and then proceed direct to Malapascua island and thence southward to Cebu.

Route 1,334. Manila to ports in the Indian ocean, and to Australia

(a) North-East Monsoon.—Take Route 1,330 to Singapore, and then take the appropriate route onward *(see Routes* 1,203 *to* 1,209 *inclusive)*.

Note.—If not calling at Singapore and bound southward through the Eastern archipelago, proceed, after passing Pulau Sapatu as in Route 1,330, between the Anamba and Natuna islands, and thence as described in Chapter II. of Section C., Part II., joining the route from Singapore for the passage onward through the Indian ocean.

(b) South-West Monsoon.—Proceed as described in Route 1,316, Hong Kong to Torres strait, as far as the Celebes sea, and thence take one of the following routes:—

(i) Continue on the Central route from the China sea to the Indian ocean. *See* Index (9) to Chapter II. of Section C., Part II.

(ii) Cross the Celebes sea to pass through Bangka straat, off the north-eastern end of Celebes island, into the Molucca sea. Thence continue southward to the Ceram sea, Manipa straat and Banda sea, to Ombai straat and the Indian ocean.

In both cases join Route 1,211, if bound to the Cape of Good Hope; or if bound to other ports join, or steer to join as directly as possible the appropriate route from Singapore as in (a).

Notes.—To Torres strait take the whole of Route 1,316 from Verde Island passage onwards.

An alternative route to Sydney is to pass into the Pacific ocean through San Bernardino strait *(See Route* 1,322 (a) (ii)). Thence proceed south-eastward, making easting until able to cross the equator in about long. 158° E., and pass through the Solomon islands; thence continue onward to the southward to join Route 1,287, Thursday island to Sydney in about lat. 15° S., long. 156° E.

Route 1,335.—*Reserved as spare.*

(v) ROUTES FROM JAPAN

Route 1,336. Yokohama to Columbia river, Vancouver, or Prince Rupert

After leaving Urago suidō and rounding Nojima saki, steer to the east-north-eastward to cross long. 167° E. in about lat. 42° N., being about 30′ to the northward of this point in August, and the same distance to the southward in January. From this point steer a nearly due easterly course, with a fair wind and a favouring current, so as to cross long. 150° W. in about lat. 44° N., keeping a little to the northward throughout the voyage during the summer months, and to the southward in the winter. From long. 150° W. proceed direct to destination, still with a fair wind. *See* British Columbia Pilot, Vol. I. for a description of the winds in Juan de Fuca strait.

CAUTION. The tidal streams, on the approach to the coast of Vancouver island, cause a general set towards the land, and an indraught on the flood into all sounds. Sailing vessels, therefore, when making the Juan de Fuca strait during the winter months, especially during November and December, and experiencing easterly and south-easterly winds, which then prevail, should endeavour to hold a position south-westward of Tatoosh island light, and on no account to open up the entrance of the strait until an opportunity occurs of getting well inside. *See* British Columbia Pilot, Vols. I and II.

Kelp.—Along the British Columbian coast, kelp will be seen on the surface of the water, growing on nearly every danger with a bottom of rock or stones, during the summer and autumn months, especially in those channels where the water is in constant motion. During the winter and spring kelp is not always to be seen, and in close harbours, where there is little motion in the water, is often absent.

It should be an invariable rule never to pass over kelp. In general, by keeping clear of kelp you keep clear of danger, but this must not prevent attention to sounding, as the rule sometimes fails; kelp is always a sign of danger, and unless the spot where it grows has been carefully sounded, it is not safe for a vessel to pass through it. A heavy surge will occasionally tear the kelp away from rocks; and a moderate stream will ride it under water, when it will not be seen. When passing on the side of a patch of kelp, from which the stems stream away with the current, care should be taken to give it a wide berth, because the kelp showing with a strong tide is on one side of, and not *over* the rocks. The least water will be usually be found in a clear spot in the middle of a thick patch of fixed kelp.

It is perhaps well to point out that kelp not attached to rock floats on the water in heaps, whereas kelp attached to rocks stream away level with the surface, whilst the leaves give an occasional flap.

See Remarks on Fogs under Route 741.

Route 1,337. Yokohama to San Francisco

(a) April to September.—Take Route 1,336 as far as lat. 44° N., long. 150° W., and thence proceed as directly as possible to San Francisco.

(b) October to March.—During the winter months, a more southerly, though rather longer, route is recommended. First steer to cross the meridian of 165° E. in lat. 40° N., and thence along that parallel as far as long. 140° W. or 135° W.; thence proceed direct to San Francisco.

Fogs.—*See* Note on Fogs under Route 740, 741 and 786.

Route 1,338. Yokohama to Honolulu

Steer to cross the meridian of 160° E. in lat. 41° 30′ N., of 180° in lat. 43° 30′ N. and of 160° W. in lat. 40° N.; thence keep south-eastward to a position in lat. 35° N., long. 153° W., and thence proceed direct to Honolulu, making allowance, on approaching the land, for a west-going current running at the rate of about 24 miles a day.

Route 1,339. Yokohama to Singapore

(a) October to April.—Proceed first to pass southward of Tanega shima and through Tokara kaikyō, between the northern end of Tokara guntō and the southern end of Ōsumi guntō; thence steer to the south-westward to join Route 1,325, Shanghai to the southward along the China coast, in about lat. 28° N.

(b) May to September.

(i) Westward of Philippine islands.—Pass eastward of all the groups of Nansei shotō, and thence through the Bashi channel. From Bashi channel make for Pulau Sapatu and thence to Pulau Aur.

The passage from Pulau Aur to Singapore is described in Route 1,315 (a), Hong Kong to Singapore.

(ii) Eastward of Philippine islands.—First steer to the southward passing to the eastward of Nanpō shotō, the chain of islands lying southward of the south-east point of Honshū. Thence make to the south-south-westward for Djailolo passage, passing about 300 miles eastward of Mindanao, Philippine islands. Then pass southward through the Ceram sea and Manipa straat into the Banda sea; thence westward through the Flores and Java seas; and finally northward through one of the straits between Sumatra and Borneo to Singapore.

For a description of, and directions for the various straits and seas between Djailolo passage and Singapore, *see* Chapter II. of Section C., Part II.

Route 1,340. Yokohama to the Indian ocean

(a) October to April.—Take Route 1,339 (a) to Singapore and thence through Malacca strait or Soenda straat to the Indian ocean.

If not calling at Singapore, proceed as above but from Pulau Sapatu, pass between Anamba and Natuna islands to Gaspar or Karimata straten, and thence to Soenda straat. *See* Chapter II. of Section C., Part II.

(b) May to September.

(i) Take Route 1,339 (b) (i), either calling at Singapore, or direct as in (a) above.

(ii) Take Route 1,339 (b) (ii), leaving it as necessary to enter the Indian ocean through Ombai, Alas, Lombok, Bali or Soenda straten. *See* Chapter II. of Section C., Part II.

Route 1,341. Yokohama to Sydney

(a) Direct route.

(i) North-East Monsoon.—Steer to cross long. 160° E. in lat. 20° N., and thence to cross the equator in long. 168° E. Thence steer to pass eastward of the New Hebrides and New Caledonia, and thence direct to Sydney, passing northward of Middleton reef.

Alternatively, after crossing the equator, pass between the Solomon and Santa Cruz islands, and then westward of Bampton reefs; and thence proceed to Sydney, making the Australian coast southward of Sandy cape and thence continue southward along the coast.

(ii) South-West Monsoon.—First make easting north of lat. 35° N. until in about long. 170° E.; thence stand southward through the North-East Trade to cross the equator in long. 173° E. Thence pass eastwards of the New Hebrides and of New Caledonia, and thence to Sydney as in (a) (i).

(b) Via Guam.—If intending to call at Guam, steer southward passing eastward of Nanpō shotō, and eastward, or westward of the Marianas, according to conditions prevailing at the time.

From Guam proceed as follows according to Monsoon.

(i) North-East Monsoon.—Make southing with the North-East Trade, and pass through Bougainville strait, or between the Solomon and Santa Cruz islands.

From Bougainville strait proceed to a position in about lat. 15° S., long. 156° E. to join Route 1,287. From the position east of the Solomon islands, proceed as in the alternative route in (a) (i) above.

(ii) South-East Monsoon.—Pass the Solomon islands as in (b) (i) and make sufficient easting to ensure a long board across the Coral sea; make, and keep along the Australian coast southward of Sandy cape, where the prevailing wind will be found to be westerly at this time of the year.

Route 1,342. Yokohama to Hong Kong, Amoy, etc.

(a) North-East Monsoon.—Stand south-westward across the Kuro shio as far as lat. 28° N., long. 135° E., thence northward of Tokuni shima (*Lat. 27° 45′ N., Long. 129° 00′ E.*), one of the Amami gunto, and after passing Tori shima (*Lat. 27° 50′ N., Long. 128° 15′ E.*) steer for Tung yung and down the coast of China.

(b) South-West Monsoon.—From Uraga suidō steer south-eastward to cross the parallel of 30° N. in about long. 145° E. Thence, passing eastward of Ogasawara guntō and eastward and southward of Kazan rettō, cross the meridian of 140° E. in lat. 21° N. Thence shape a direct course to pass northward of Luzon and straight to Hong Kong, making allowance for the north-easterly set in the China sea.

Route 1,343. Yokohama to Shanghai

In all seasons the best route is through Naikai or Inland sea. Keep near the coast of Japan, to avoid the strength of the Kuro shio, until round Ō shima at the entrance to Kii suidō.

Having cleared Naikai through Shimonoseki kaikyō proceed as directly as possible to Shanghai, giving Socotra rock (*Lat. 32° 07′ N., Long. 125° 11′ E.*) a wide berth.

Naikai.—Notes.—Wind permitting, the route usually followed by sailing vessels, both east and west bound, is as follows.

Entering Naikai through Kii suidō, pass into Ōsaka wan or Izumi nada, through Tomo-ga-shima suidō, and thence northward to Akashi seto. Having passed through Akashi seto, keep northward of Kami shima and all the islands of Ieshima (Iye shima) guntō, and then steer to the south-westward to pass northward of Shōdo shima; after which Bisan seto may be entered by one of the following routes:—

(a) Pass either side of Dango se (*Lat. 34° 31′ N., Long. 134° 05′ E.*), and then turn southward through Ishima suidō, between I shima on the west and Te shima on the east, into Bisan seto.

(b) Pass northward of Dango se and I shima; between Tsubone shima and Kyō-no-jōrō (Kionodyoro) shima, and then westward into Katsura shima suidō, which leads southward into the northern part of Bisan seto.

Having entered Bisan seto from (a) or (b), continue westward to pass southward of Mitsugo (Kamifutaomote) shima and of Oki-no su, and then on either side of Takami shima, and southward of Mu shima in Bingo nada.

Steer across Bingo nada to enter Mekari seto, passing northward of Hyakkan shima (*Lat. 34° 18′ N., Long. 133° 16′ E.*). Follow the pecked line shown on the charts through Mekari seto, Aogi seto, Mihara seto and Ōge seto into Aki (Misima) nada. Pass south-westward through Aki nada to enter Iyo nada through Tsurushima suidō in summer, or through Kudako suidō or Nuwashima suido in winter.

Follow the northern track on the charts passing northward of Sengai se (*Lat. 33° 49′ N., Long. 132° 22′ E.*), and through Heigun suido; thence having passed Amata shima, turn north-westward to enter Suō nada through Hanaguri seto. Keep along the northern side of Suō nada, passing southward of Omo se and Motoyama-no su light, about 3 miles southward of Ube misaki; thence pass out of Naikai through Shimonoseki kaikyō.

CAUTION. Sailing vessels should anchor at night when navigating in Naikai.

Note.—A vessel eastbound should follow the above route in reverse.

Vessels in tow.—These vessels, sometimes as many as ten in number and forming a tow of as much as 440 yds. (402$^{\text{m}}$3) in length, may be met in the Naikai. For details of the route followed by these tows, *see* Japan Pilot, Vol. II.

Route 1,344. Yokohama to Hakodate

(a) Winter route.—In winter make the passage as close inshore as safety will allow, as the wind is usually off the land and there is smooth water near the coast. In the event of falling in with a north-east gale, the best course is to make for the nearest sheltered anchorage, if any such is available. The frequent snowstorms often obscuring the land, and the irregularity of the currents, render it necessary to use every precaution when navigating this part of the coast.

(b) Summer route.—In summer keep offshore and take advantage of the Kuro shio. Fogs will usually be met with when as far north as Kinkasan (Kinku-

wasan) tō. Close the land to the southward of Shiriya zaki, and round that promontory at a distance of not less than 2 miles to avoid Ōne.

In thick weather, when the land about Shiriya saki has not been seen, a rise in the temperature of the water, the presence of floating *debris*, such as plants, trees and driftwood in the sea, or heavy tide rips, may assist in determining that the vessel is to the northward of Shiriya saki and in the influence of the easterly current through Tsugaru kaikyō.

Navigational note.—Directions for Tsugaru kaikyō and Hakodate from the eastward and westward.

(1) *From the eastward.*—Approaching the strait from the eastward the adverse current will be avoided by keeping near the shore, giving Ōne and the dangers off Ōma saki a berth.

Make Shiriya saki (*Lat. 41° 26′ N., Long. 141° 27′, E.)*, bearing about 310°, and pass it at a distance of not less than 2½ miles; when northward of it, keep towards the southern shore to avoid the current and to be in a position to anchor should it be calm. By keeping towards this shore, a vessel may possibly be drifted for a considerable distance by the west-going stream, while the north-east current is running strongly in mid-channel of the strait.

Wait at anchor south-eastward of Ōma saki for a favourable opportunity to cross the strait, and as the winds during summer are generally light from the south-westward for a considerable period, freshening a little when the west-going stream makes, this is the proper time to weigh. *See* also Note (2) below.

If proceeding direct for Hakodate from the eastern entrance to Tsugaru kaikyō, proceed as follows:—

After passing 5 miles off Shiriya saki, steer for Esan (Yesan) misaki, so as to take advantage of the cold west-going stream along the south coast of Hokkaidō, remembering that the north-east current is sometimes found close inshore near Shiokubi misaki.

(2) *From Hakodate to the westward.*—Proceeding from Hakodate to the westward, against south-westerly winds, keep near the shore when northward of Yagoshi misaki, and if unable to round it, anchor with a kedge about 2 miles north-eastward of it, weighing again when the next west-going stream makes.

With a light wind a sailing vessel might not clear the strait in one tide, in which case it would be better to wait a tide at anchor, to the eastward of Shirakami zaki, and take the whole of the following tide to get sufficiently to the westward, rather than run any risk of being swept back through the strait by the current.

(3) *Tsugaru kaikyō from the westward.*—Approaching the strait from the south-westward during foggy weather, guard against being carried by the current to the northward past the entrance; should the weather be clear when nearing Nyūdō saki, it might be as well to sight it.

In the event of thick weather coming on, when nearing this cape, good though open anchorage in a sandy bottom will be found to the southward of it; but to the northward the bottom is rocky though anchorage is still possible.

Currents.—Tidal streams.—Ice.—See Japan Pilot, Vol. I.

CAUTION. Sailing vessels, passing through the strait, particularly to the westward, should be provided with a good kedge and 150 fathoms (or about 275 metres) of hawser, ready for immediate use, and keep the shore close aboard.

Route 1,345. Nagasaki to China coast ports

(1) To SHANGHAI.—Steer as direct a course as circumstances will allow, keeping rather to windward of the port as, except near the coast of Japan, the drift of the current is usually to leeward.

CAUTION. Give Socotra rock (*Lat. 32° 07′ N., Long. 125° 11′ E.*) a good berth. *See* China Sea Pilot, Vol III.

(2) To HONG KONG, AMOY, SWATOW, ETC.

(a) North-East Monsoon.—Steer to make the coast of China a little southward of the Chusan archipelago, and thence keep along the coast.

(b) South-West Monsoon.—First stand across to the coast of China and thence make southward keeping along the coast.

Routes 1,346 to 1,350.—*Reserved as spare.*

See Section D. Part III. Index on pages 357 and 358.

SECTION C. PART III.

Chapter III

SAILING-SHIP ROUTES FROM ISLANDS OF THE NORTH PACIFIC OCEAN, AND FROM PORTS ON THE EASTERN SIDE OF THE PACIFIC OCEAN

(i) ROUTES FROM ISLANDS OF THE NORTH PACIFIC OCEAN

See " Navigation in the Pacific ocean " at the beginning of Chapter II. of Section B., Part IV., on pages 127 and 128; and also the Cautions at the beginning of Sub-section (iv) of Chapter I. of Section C., Part III., on page 295.

In this sub-section only the routes from Honolulu (Hawaiian islands) are described in detail. From other islands of the North Pacific ocean, the most favourable route to be taken can be ascertained by consulting the following charts, all of which will be found in the pocket at the end of this book. *See* also Routes 1,351, 1,352 and 1,353.

Chart 5,308.—The World—Sailing ship routes.

Chart 5,301.—World Climatic chart, sheet I.

Chart 5,302.—World Climatic chart, sheet II.

Chapter I. of Section B., Part IV. of this book, which deals with the Winds and Weather, Currents and Ice in the Pacific ocean in more detail than Charts 5,301 and 5,302, should also be consulted.

In Route 1,351 below, a general outline of the best passages from the islands to Asia or Australia to the westward, or to North and South America to the eastward is given; while in Route 1,352 some notes on passages amongst the islands will be found.

Route 1,351. From islands in the North Pacific ocean (except Hawaii), to ports in Asia, or to North and South America

A glance at Chart 5,308 shows that little difficulty will be experienced in deciding on the most profitable route for a vessel bound westward to any port in Asia, the Eastern archipelago, the Indian ocean, or Japan; a number of routes from North or South America and from Australia pass near the islands and can be joined at a convenient position.

For a vessel bound to the eastward, the general principle is to stand northward, or southward, through the trade winds to reach the belt of westerly winds as quickly as possible; a favourable current may be expected in the area of westerly winds. Passages across the Pacific ocean bound eastward that may conveniently be joined are as follows:

North Pacific.—Routes 1,336 and 1,337 and, in some cases, 1,338, all from Yokohama.

South Pacific.—Routes 1,260 and 1,261 from Sydney; or a vessel may make to the southward across these two routes to join Route 1,251, the Main route across the Southern ocean.

Route 1,352. North Pacific islands (except Hawaii) to other islands in the North or South Pacific ocean and Australia (Sydney)

(1) To OTHER ISLANDS IN THE NORTH PACIFIC OCEAN.

(a) Bound westward.—No difficulty should be experienced as a fair wind should be carried and, except in the Equatorial Counter-current *(Lat. 4° N. to 8° N. (approx.))*, a favourable current should assist the passage.

(b) Bound eastward.

(i) To Honolulu (Hawaiian islands).—Stand northward through the trade winds as far as about lat.40° N. or until the westerly winds are met. Cross the 180th meridian in about lat. 43° N., and long. 160° W. in lat. 40° N.; thence keep south-eastward to a position in about lat. 35° N., long. 153° W., and thence proceed direct to Honolulu. *See* Route 1,338 from Yokohama.

(ii) To other North Pacific islands.—Over short distances the direct mean course can be used, but it usually means working eastward against the North Equatorial current.

In most cases, it is probably best to stand southward, or south-eastward into the Equatorial Counter-current, and thence work eastward until able to fetch the destination, making allowance for a west-going set as the vessel gets northward.

(2) To ISLANDS IN THE SOUTH PACIFIC OCEAN OR AUSTRALIA (SYDNEY).—The longitude of most of the main island groups of the South Pacific ocean is eastward (certainly little or nothing westward) of that of similar groups of the North Pacific ocean (except the Hawaii islands). Therefore the first objective, in all passages, must be to make easting while still north of the equator which is usually crossed between longs. 168° E. and 173° E. Probably the most advantageous passage to reach this objective is to stand southward, or as much to the south-eastward as can be made on the port tack, until the region of the Equatorial Counter-current is reached (between lats. 4° N., and 8° N.); then work eastward until able to stand across the equator as stated above. From the equator proceed southward as follows:—

Bound to Solomon islands, New Hebrides or New Caledonia, proceed direct.

Bound to Sydney, follow the relevant part of Route 1,341 (a) (i), or (ii) from Yokohama.

Bound to Fiji, pass down the western side of the Ellice islands and then direct.

Bound to Samoa, stand southward as far as the latitude of the Fijian islands if necessary, weathering them if possible until able to make Samoa on the starboard tack.

Bound to islands to the eastward of Samoa, it is best to stand southward through the trade winds into the westerlies; then run down easting until the meridian of the island to which bound is reached. Then re-enter the trades and proceed to destination.

Route 1,353. North Pacific islands to Thursday island (Torres strait)

At all seasons of the year the route eastward of New Guinea may be taken, following generally the directions in Route 1,316 (2) (b) modified as necessary, as far as the equator, in accordance with the position of the island of departure, e.g., from the eastern or western groups of islands.

See Section D. Part III. Index on pages 357 and 358.

In the North-east Monsoon season as good, or even a better passage may be made by steering direct to pass through Djailolo passage and joining Route 1,316 (1) (a) in the Ceram sea.

Route 1,354. Honolulu to Tahiti

General remarks on winds, currents and sailing passages around the Hawaiian islands.

(a) Winds.—The easterly trade winds seem to divide at Cape Kumukahi, part following the coast north-westward around Upolu point, where it loses its force, the other part following the south-east coast around Ka Lae, where it also loses its force.

On the west coast of Hawaii the sea breeze sets in about 0900 hours and continues until after sundown, when the land breeze springs up.

Sailing vessels from the westward bound to ports on the windward or south-eastern side of Hawaii should pass close to Upolu point and keep near the coast, as the wind is generally much lighter than offshore. Those from the westward, bound to ports on the eastern side of Hawaii should keep well to the northward until clear of Alenuihaha channel.

Current.—On account of the current, which nearly always sets to the northward along the west coast of Hawaii, it is advisable for sailing vessels to make the land to the southward of their port, as during calms and light airs a vessel is liable to drift to the northward.

Navigational notes.—Alenuihaha channel, which separates Hawaii from Maui and Kahoolawe islands, is 26 miles wide and clear of dangers. During the North-East Trade, the wind frequently blows through the channel with great strength, and there is also a strong current setting westward; but during calms, which frequently follow, there is at times an easterly set of about one knot which during *kona* winds may increase to 2 or 3 knots.

Vessels from any of the western ports of Hawaii are therefore recommended to keep close in under the lee of the island until reaching Upolu point, when they will be enabled to fetch across to the Alalakeiki channel on the western side of Maui. Those from the northward, bound to Hilo, will probably find it impossible to weather Upolu point from the western side of Maui, but on getting under the lee of Hawaii the trade wind fails until reaching the southern point of the island, when they will have to beat against wind and current along the south-eastern coast.

Route to Tahiti.—Stand first to the northward of the Hawaiian islands, and then make all possible easting before entering the trade winds. Cross the equator as far to the eastward as possible, in order to reach destination with a fair wind.

Route 1,355. Honolulu to Fiji, Australia, and New Zealand

(1) To FIJI.—Proceed as directly as navigation permits, with a fair trade wind.

(2) To AUSTRALIA AND NEW ZEALAND.—Take (1) above as far as Fiji, and then take Route 1,276 (1) to Australia, or Route 1,276 (2) to New Zealand, but leaving the route to Fiji in about long. 170° W. to 175° W., and proceeding direct in the latter case.

Note.—Except when bound to Auckland, owing to the prevalence of westerly winds off the New Zealand coast, it is best to pass down the west coast of New Zealand, and through Cook strait for ports in North Island (if conditions are favourable) or round South Island and northward along the east coast.

Route 1,356. Honolulu to ports in China or Japan, or the Philippine islands

Routes 1,366 to 1,369, from San Francisco to these destinations pass close to the southward of Hawaii island, and should be picked up at any convenient point between long. 160° W. and 170° W.

Route 1,357. Honolulu to San Francisco

At all seasons, first steer due north before turning eastward on reaching the steady westerly winds. The turning point varies in latitude throughout the year, being farthest north in August and farthest south in November and December. The various routes are roughly as follows:—

(a) In August.—Turn eastward in approximately lat. 40° N., and steer along that parallel to long. 150° W. Thence proceed direct to destination.

(b) In June and July.—Turn to the north-eastward in about lat. 35° N. to 36° N., and steer on a slightly curving course to cross long. 150° W. in approximately lat. 39° N., and then proceed direct. *See* note below.

(c) In May, September and October.—Turn to the north-eastward in about lat. 30° N., and steer on a curving course to cross long. 150° W. in approximately lat. 37½° N. to 38° N., and then proceed direct. *See* note below.

(d) In March and April.—Turn to the north-eastward in about lat. 26° N. to 27° N., and steer on a curving course to cross long. 150° W. in about lat. 36½° N., and then proceed direct. *See* note below.

(e) In January and February.—Turn to the north eastward in about lat. 25° N. to 26° N., and steer on a curving course to cross long. 150° W. in about lat. 33° N., and then proceed direct. *See* note below.

(f) In November and December.—Turn to the north-eastward in about lat. 24° N., and steer on a curving course to cross long. 150° W. in about lat. 32° N. to 32½° N., and then proceed direct. *See* note below.

Note.—The curving course referred to in (b) to (f) above can best be understood by referring to Chart 5,308, a copy of which will be found in the pocket at the end of this book.

Fogs.—See Notes under Routes 740, 741 and 786.

Route 1,358. Honolulu to all other ports in America southward of San Francisco

(1) TO PORTS IN NORTH AMERICA SOUTHWARD OF SAN FRANCISCO OR TO PANAMA.—Proceed northward as in Route 1,357, but turn eastward instead of north-eastward. Make easting as directly as possible, gradually altering course to east-south-eastward after reaching about long. 150° W. to 140° W., depending on destination, the latter to the more southerly ports. Join Route 1,372 from San Francisco at a convenient point.

(2) TO PORTS IN SOUTH AMERICA OR TO CABO DE HORNOS (CAPE HORN).—The most important objective must be to make easting as soon as possible so as to be able stand south-eastward to join Route 1,373 or 1,374, San Francisco to South American ports, or Route 1,375, San Francisco to Cabo de Hornos. In any case it appears advisable to join these routes to the north of the Equator, where the Equatorial Counter-current is available if getting too far westward on the passage southward.

(ii) ROUTES FROM PRINCE RUPERT, VANCOUVER, OR COLUMBIA RIVER

Route 1,359. Prince Rupert, Vancouver or Columbia river to Honolulu and Yokohama

From Prince Rupert, stand southward through Hecate strait, and from Juan de Fuca strait or Astoria, Columbia river, stand seaward to make a safe offing, but keeping as close inshore as prudence dictates, to avoid the heavy seas experienced further out. Proceed southward until within about 300 miles north-west of San Francisco, and thence proceed direct to Honolulu. Thence continue as follows:—

(a) May to November.—Get on to the parallel of 20° N., and run westward on it as far as the meridian of 180°. Thence steer to cross the meridian of 160° E. in lat. 25° N., and thence for Yokohama, allowing for the north-easterly set of the Kuro shio.

(b) December to April.—During the winter months a vessel may have to keep further south to get the strength of the trade for the run to the westward after leaving Honolulu. The directions given in Route 1,366 (a), (b) or (c), from San Francisco should be followed, according to date, after running westward.

(c) Alternative route.—All seasons.—From Honolulu keep south-westward to join one of the seasonal routes from San Francisco to Yokohama. *See* Route 1,366.

Route 1,360. Prince Rupert, Vancouver or Columbia river to Sydney

From Prince Rupert, stand to the southward until reaching the North-East Trade wind, passing on either side of the Queen Charlotte group.

From Juan de Fuca strait, or from Astoria, Columbia river, stand to the south-westward at once, to pick up the trade wind.

Then proceed as directly as possible, crossing the equator in about long. 170° W., and passing westward of the Fiji islands and south-eastward of New Caledonia, from June to August, but at other times of the year, crossing the equator between long. 150°-155° W., and passing southward of the Tongan and Fijian island groups. Make the Australian coast southward of Sandy cape *(See Route* 1,341).

Route 1,361. Prince Rupert, Vancouver or Columbia river to San Francisco and to South American ports

Note.—The following route is that which used to be described in the British Columbia Pilot, Vol. I.; it differs in some degree from the route that was recommended by the U.S.A. Hydrographic Office. The latter will be found in Routes 1,373 to 1,375 from San Francisco to South American ports.

(1) To San Francisco.—At all seasons keep as near the shore as is prudent, in order to avoid the heavy sea felt further out.

(2) To South American ports.

(a) October to March.—South-east and south-westerly winds prevail on the coast of California as far south as about lat. 25° N. If bound from Vancouver to Valparaiso in this season stand down the coast, keeping at about 100 miles from it until near the latitude of San Francisco, and from thence pass westward of, and in sight of, Isla Guadalupe *(Lat. 29° 11′ N., Long. 118° 17′ W.)*, where in all probability the North-East Trade wind will be met with; then steer to sight Clipperton island *(Lat. 10° N., Long. 109° W.)*, passing westward of it; in about this latitude the North-East Trade wind will be lost.

The belt of variable winds and calms, which at this season, on the meridian of 120° W., is 250 to 350 miles wide will here be entered, and it may not be possible to cross the equator much to windward of long. 118° W. Every effort should be made not to cross fruther than that to the westward, as the result would be that the vessel would not weather Elizabeth or Pitcairn islands, in the vicinity of which light baffing winds from south to south-east would be experienced.

In all probability at this time of year the South-East Trade wind will be met between lat. 5° N. and 3° N.; the higher latitude during the early winter months (November and December), and the lower latitude towards March, when the ship should be kept full, making, as nearly as the wind will permit, a course of 180°.

In about lat. 6° S. the Trade winds generally become more easterly in direction, sometimes hauling northward of east. Cross the parallel of 20° S. in long. 124° W., and the parallel of 35° S. on the meridian of 120° W; thence cross the meridians of 110° W. in lat. 39° S., 100° W. in lat. 40° S., 90° W. in lat 39° S. and thence proceed direct, southward of Juan Fernandez to Valparaiso. From Valparaiso to Callao steer straight up the coast. Calms and variable winds will be experienced in the vicinity of the lat. 30° S. settling into the north-west quarter as the vessel gets more to the southward. *See also* Route 1,373.

(b) April to September.—During these months a coures further west may be pursued, passing the latitude of San Francisco in about long. 129° W. Thence keep further from the land to avoid the calms and light variable winds experienced at this season along the coast of lower California and in the bay of Panama. After meeting the North-East Trade wind in about lat. 30° N., long. 127° W. stand to the southward, on or near the meridian of 125° W. not only to avoid the calms above mentioned, but also the hurricanes which during August and September are liable to be met with eastward of that meridian. Occasionally, but rarely, these storms are met with west of long. 125° W.

The North-East Trade wind will be lost at this season in lat. 11° or 12° N., and the belt of doldrums will be found to be not so wide as during the winter months. The South-East Trade wind will, at this season, be met with in about lat. 8° N., and if, as is most likely to be the case at the commencement, the wind be well to the southward, stand to the eastward in order to recover some of the ground lost by keeping further to the westward in the North-East Trades. Endeavour to cross the equator in from long. 118° to 120° W., and soon after crossing, the wind will haul more to the eastward, when stand to the southward to weather Ducie island and reach the parallel of 40° S. before making easting, so as to fall in with the north-westerly winds, as calms and variable winds are met with north of that parallel. After passing the meridian of 90° W. haul up for Juan Fernandez and thence for Valparaiso.

Route 1,362.—*Reserved as spare.*

(iii) ROUTES FROM SAN FRANCISCO

Route 1,363. San Francisco to Prince Rupert, Juan de Fuca strait or Columbia river

(a) November to April.—From November to April, or during the bad weather season, the passage should commence by putting well out to sea. This will be easy to do, as the wind is oftenest from the north-westward. When far enough off to have nothing to fear from south-westerly or north-westerly winds, make as much northing as possible. North of the parallel of Cape Mendocino, south-westerly winds prevail, enabling vessels to finish the voyage without difficulty, but the land should be made 20 to 30 miles southward of the port.

(b) April to November.—From April to November, the fine weather season, the wind almost invariably blows from the northward between north-west and north-east. After leaving San Francisco run about 200 miles off-shore, and then make to the northward, profiting by every shift of wind, and always standing on the most favourable tack. It would be well not to approach the land until up to the parallel of the port unless the vessel can fetch her port, or nearly so without tacking. If bound to Prince Rupert it would be well not to approach the land until nearly abreast of Langara island, at the north-west extreme of Queen Charlotte island. Hecate strait, between

Queen Charlotte island and the mainland may also be taken, and is considered safe, but has not yet been thoroughly surveyed.

Note.—For a description of the winds and currents on this coast *see* British Columbia Pilot, Vols. I. and II.

See also Caution regarding Tidal streams, and remarks on kelp under Route 1,336 and remarks on Fogs under Route 741.

Route 1,364. San Francisco to Unimak pass, Aleutian islands, and vice-versa

(1) From San Francisco to Unimak pass.—The United States Pilot Charts give tracks for sailing vessels for the months of May to October inclusive as follows:—

(a) May and June.—Keep westward from San Francisco to long. 145° W., and thence proceed direct to Unimak pass.

(b) July, August and September.—Continue westward to long. 155° W. before turning northward.

(c) October.—Continue westward to long. 158° W. before turning northward.

(2) From Unimak pass to San Francisco.—Proceed as directly as possible.

Route 1,365. San Francisco to Honolulu

At all times of the year the route to China and Japan passes closely southward of the Hawaiian islands, and is therefore nearly directly for Honolulu. On leaving San Francisco run to the south-westward for the North-East Trades; from June to December clear the coast as soon as possible, steering about 266° to avoid the calms eastward of long. 128° W. Near the Hawaiian islands the trades may possibly veer to east or even south-east, particularly from October to May; approach the land from east-north-eastward, when all local winds will be fair. When making a landfall remember that the currents often run at the rate of 20 miles per day, and that calms and baffling winds are common to leeward of the islands.

See General remarks on winds, currents and sailing passages around the Hawaiian islands at the beginning of Route 1,353.

Route 1,366. San Francisco to Yokohama

Proceed as in Route 1,365 but pass southward of Hawaii island. Then stand to the westward between the parallels of 15° N. and 20° N., being to the northward in the summer, and to the southward in the winter. On reaching the meridian of 160° E., proceed as follows:—

(a) From January to April.—Stand on still to the westward on the former course, until reaching the meridian of 150° E., and then curve gradually round to the west-north-west, north-west and finally north; pass about 60 miles to the westward of the Ogasawara guntō and westward of the other islands of the Nanpō shoto on a northerly course to destination.

(b) May and June.—Make to the west-north-westward at once, so as to cross the meridian of 150° E. between lat. 23° N. and 24° N.; thence proceed direct to destination, passing about 200 miles eastward of Ogasawara guntō.

(c) From July to December.—In these months leave the track across the Pacific ocean at long. 163° E. instead of 160° E., and set a course as directly as possible to Yokohama.

Alternatively, some navigators recommend standing for Yokohama on reaching the 180th meridian; but this is not a very usual practice.

Caution. At all times of the year, allowance must be made for the Kuro shio, setting across the track during the latter part of the voyage.

Route 1,367. San Francisco to Hong Kong or adjacent ports

Follow Route 1,366 as far as long. 160° E., and then stand slightly to the northward to clear the northernmost of the Mariana or Ladrone islands, and then pass through Bashi channel to destination.

Notes.—Notes on Bashi channel are to be found in Route 1,138 (4) (b). For an alternative route in the North-East Monsoon *see* Route 1,332 (a) (ii). *See also* Route 1,369 for the passage via Manila.

Route 1,368. San Francisco to Shanghai or Nagasaki

Follow Route 1,367 across the Pacific ocean, but on arriving in about long. 135° E., make as directly as possible for either destination.

Route 1,369. San Francisco to Manila or to China coast ports from Hong Kong southward as far as Singapore

(a) North-East Monsoon (October to March).—Take Route 1,367 to the Bashi channel, and then proceed southward to Manila. To other ports the route is as follows:—

Bound to Hong Kong.—See Route 1,367 and Notes.

Bound to Saigon.—Proceed direct across the China sea allowing for the current which sets with the wind.

Bound for Singapore.—Proceed as in Route 1,339 (a) (ii).

(b) South-West Monsoon (April to September).—Leave the west-going track across the Pacific ocean in long. 160° E. *(See Route* 1,366), and steer to cross the meridian of 150° E. in lat. 15° N. Thence, passing southward of the Mariana or Ladrone islands, stand directly for San Bernardino strait or for Surigao strait *(see note below);* and thence proceed as directly as possible to Manila, Iloilo, etc.

From Manila (or from Mindoro strait or Verde Island passage if not calling at Manila) proceed as in Routes 1,330 to Singapore, 1,331 to Saigon, 1,332 to Hong Kong or Amoy.

Note.—A description of, and notes on San Bernardino strait is to be found in Route 1,138 (2); of Surigao strait in Route 1,138 (1); of Verde Island passage in Route 1,138 (3); and of Mindoro strait in Route 1,155.

Caution. *See* the second paragraph of the Caution under Route 1,142.

Route 1,370. San Francisco to Brisbane, Sydney and ports to the southward

The routes usually followed, according to season, are described in (a) (i) and (ii) below; alternative routes recommended by French authorities are described in (b) (i), (ii) and (iii).

(a) Usual routes.—On leaving San Francisco, take a direct course through the North-East Trade wind to a position in about lat. 10° N., long. 145° W. Thence proceed as follows according to season.

(i) June, July and August.—Steer a direct course, passing northward of the Fiji islands and southward of New Caledonia to Brisbane direct or, making the coast southward of Sandy Cape, to Sydney. From Sydney take Route 1,234 or 1,258 to ports to the southward.

(ii) During the rest of the year.—Continue on a direct course from lat. 10° N., long. 145° W. to cross the equator at a point between long. 150° W. and 153° W. as follows:—

December, January and February.—In long. 152° W.

March to June.—In long. 150° W.

September, October and November.—In long. 152° W. to 153° W.

At whatever point the equator is crossed, cross lat. 10° S. near long. 155° W., and thence pass southward of the Tongan (or Friendly) islands; cross the 180th meridian in latitude 24° to 25° S., and long. 160° E. at lat. 26° to 27° S. Thence proceed to destination, passing northward of Middleton reef, if bound to Sydney making the coast southward of Sandy cape. *See* Route 1,341.

(b) Alternative routes (recommended by French authorities).

(i) January to July.—Steer to cross lat. 10° N. in long. 143° W., and the equator in long 148° W. In January, February and March no calms will be found between the North-East and South-East Trades. In April, May and June there will be only about 2 per cent. of chances of calms in this region. From the equator steer for a position in lat. 10° S., long. 155° W., and continue thence as in (a) (ii) above.

(ii) July, August and September.—Steer to cross lat. 10° N. in long. 148° W., and the equator between long. 150° and 153° W. In this season, and if the precaution be taken not to follow a more easterly route than the one indicated, there will be only from 2 to 3 per cent. of calms between lat. 10° N. and the equator. Thence proceed as in (b) (i) above.

(iii) October to January.—Steer to cross lat. 10° N. in long. 138° W., and the equator in long. 143° W. By following this route there will be only from 2 to 3 per cent. chances of calms between the two trade wind regions. Farther to the westward at this season, the ship would be liable to meet more calms. Thence proceed as in (b) (i) above.

Route 1,371. San Francisco to Pacific islands

(1) To NORTH PACIFIC ISLANDS.—Stand to the south-west into the trade and the North Equatorial current, and then run to the westward in about lat. 15° N. as far as about long. 170° W.; thence steer as directly as navigation permits to destination.

(2) To TAHITI.—Steer south-westward on nearly the direct course to cross the equator in long. 140° W., or a little to the eastward, and then direct, allowing for the set of the South Equatorial current.

(3) To SAMOA, FIJI AND ISLANDS TO THE WESTWARD.—Follow generally the directions in Route 1,370 (a) (ii) until arriving on the parallel of the island to which bound, and then run westward on this parallel to destination.

Route 1,372. San Francisco to Panama

(a) December to May.—Making this passage between the months of December and May inclusive, when the prevailing winds on the west coast of Mexico are from the northward and the current favourable, first obtain a good offing, and then stand down the coast of California, keeping about 100 miles off, and at about 150 miles off the coast of Mexico, shaping a course to make Isla Jicarita, the southernmost of the islands southward of Isla Coiba and about 55 miles westward from Punta Mariato, which is a good landfall for vessels bound to Panama from the westward.

(b) June to November.—Between the months of June and November, inclusive, when calms, variable winds and oftentimes hurricanes prevail on the west coast of Mexico, stand well out to sea after passing San Francisco, and then shape a course to cross the equator in about long. 104° W.; thence stand on to the southward, until sure of reaching Panama on the other (starboard) tack.

Note.—Bound to Panama from the northward try and make the Isla Jicarita, which lies about 55 miles westward of Punta Mariato, and from this endeavour to keep under the land as far as Cabo Mala. If unable to do this, stand across for the opposite coast of the continent, when the current will be found favourable. On getting eastward of Cabo Mala the safest plan is to shape a course for Isla Galera, and to use the eastern passage. At the same time, if tempted up the gulf by a fair wind, endeavour to get on the western side of the Archipiélago de las Perlas, where anchorage and less current will be found should the wind fail.

Notes on Winds and weather, and currents (Colombia coast).

Winds and weather.—Northward of Punta Guascama, the winds become more variable and rains more frequent, and the following account by Dampier is perhaps as good as can be given:—" It is a very wet coast, and rains abundantly all the year. There are but few fair days, for there is little difference in the seasons of the year between the wet and the dry; only in that season which should be dry the rains are less frequent and more moderate than in the wet season, for then it pours as out of a sieve." This kind of weather is found as far as Cabo Corrientes (*Lat. 5° 30′ N., Long. 77° 33′ W.*), the prevailing wind being south-west, but north-east winds are not uncommon. Offshore in this zone, between the parallels of 2° and 5° N., the winds are equally baffling, especially during the months of March, April and May.

Between Cabo Corrientes and Panama, the prevailing winds are from the northward and westward, with frequent squalls and wet weather from the south-west between the months of June and October.

Currents.—Within 60 miles of the coast there is a constant current to the northward. After passing Cabo Mala it meets the Mexican current from the west-north-westward, and thus causes the numerous ripplings and short uneasy sea so often met with at the entrance of the gulf of California. This troubled water will be found more or less to the southward, according to the strength of the contending streams.

Route 1,373. San Francisco to Callao or Iquique

Make an offing from San Francisco of about 300 miles to the south westward; and then work round gradually to the southward so as to cross lat. 30° N. at about long. 127° W. From this point make a straight course to the south-south-eastward roughly parallel to the coast, making for a position in lat. 5° N., long. 110° W., in about which point the South-East Trades will be met. Stand through the trades on the port tack so as to fetch to lat. 20° S. at long. 118° W.

From this point a course gradually approaching the coast may be made, as the trade wind is lost and the westerly winds are felt. The most southerly point reached will be as follows.

Between September and November.—About lat. 34° S., long. 110° W.

From December to May.—About lat. 37° S.

In June, July and August.—Some intermediate latitude between the above.

As the coast is neared, southerly winds and a north-going current will be obtained, by which the destination may be reached. In any case make the port well to the southward, in order to allow for this north-going current running the whole length of the South American coast.

Route 1,374. San Francisco to Coquimbo, Valparaiso and Coronel

Proceed as in Route 1,373, but do not attempt to make much easting after arriving in lat. 20° S., long. 118° W. until well to the southward of lat. 35° S.

Make the coast well to the southward of destination, in order to allow for the north-going current running the whole length of this coast.

Route 1,375. San Francisco to round Cabo de Hornos (Cape Horn)

Get a good offing of about 300 miles from San Francisco, and then stand nearly due south so as to cross lat. 5° N. as follows:—

December, January, and February.—At about long. 126° W.

During the rest of the year.—Between long. 120° W. and 122° W., being farthest to the eastward in March.

When the South-East Trades are met with, stand to the southward so as to cross lat. 30° S. in about long. 124° W.; and as soon as the trades are lost and the westerly winds picked up, as they will be in these latitudes, make as direct a course as possible to round Cabo de Hornos closely in the summer months (from September to February), but 60 to 80 miles to the southward of it in the winter months.

See Route 1,083 (1) for directions for rounding Cabo de Hornos.

Routes onward from Cabo de Hornos.—See Route 1,083 (2) and (3) to the Channel, Route 1,084 to North American Atlantic ports, Route 1,085 to South American Atlantic ports, Route 1,086 to Cape Town and Route 1,087 round the Cape of Good Hope to the Indian ocean.

Note.—Fogs.—These are rare on the coast of Tierra del Fuego and in the vicinity of Cabo de Hornos (Cape Horn), but thick rainy weather prevails, with strong winds, the sky even in moderate weather being generally overcast and cloudy; a clear day is a rare occurrence.

Routes 1,376, 1,377, and 1,378.—*Reserved as spare.*

(iv) ROUTES FROM LOWER CALIFORNIA AND FROM PANAMA

Route 1,379.—From ports in Lower California northward to North American ports

On account of the contrary current, the only way to make a passage from any port of this coast to the northward is to stand out to sea on the starboard tack until the variable winds are reached, in about long. 130° W., and then make northing, as in Route 1,363. From July to January vessels may have to stand on as far as long. 140° W.

Lumber vessels bound to Juan de Fuca strait, have found it advantageous to keep as near the land as practicable, in order to take advantage of the south-easterly storms, which work round to the south-westward. Rapid passages have been made in this manner.

Route 1,380. Ports in Lower California to ports in the Pacific ocean

(1) To THE NORTHWARD ALONG THE COAST. *See* Route 1,379.

(2) To HONOLULU AND NORTH PACIFIC ISLANDS.—Proceed direct when in the North-east Trades. *See* Routes 1,365 and 1,371.

(3) To SYDNEY.—Steer to join Route 1,370 (a) (i) in lat. 10° N., long. 145° W. during June, July, and August, and Route 1,370 (a) (ii) at the equator during the remaining months of the year.

(4) To OTHER PORTS AND ISLANDS IN THE PACIFIC OCEAN.—Steer to the south-west or west to join the appropriate route from San Francisco at a convenient point.

Route 1,381. Panama to ports in Central America

(a) Passage out of Panama bay.—General notes.—Bound in any direction from Panama, the chief difficulty is the passage out of Panama bay, for light and baffling winds or calms are met with there at all seasons.

Between October and April, the prevailing wind in the gulf is from the northward; for the remainder of the year the wind hangs more to the westward, and land and sea breezes are felt, varied by calms and occasional squalls from the south-westward. Northward of lat. 5° N., between the 80th and 110th meridians W., is a region of calms and light winds, varied by squalls of wind and rain; but southward of lat 5° N., westward of the meridian of 80° W., between the mainland and Archipielago de Colon (Islas Galápagos), the wind is between south and west all the year round, and except between the months of February and June, is fairly strong. Whether bound north or south from Panama push to the southward and gain the South-East Trade; by so doing the doldrums and vexatious winds will not only be avoided but there will be the additional advantage of salubrious weather, with the sea at a temperature of 75° instead of 83° Fahr.

(b) To ports of Central America.—The passage to ports along the coast of Central America is slow and troublesome to sailing vessels; advantage must be taken of every shift of wind to get to the north-westward. The currents will be with the ship as far as the Golfo de Fonseca, when the Mexican stream will be fairly met, and if bound to Acapulco or Mazatlan, the passage may be better made by standing off from the coast, after reaching Fonseca (*Lat. 12° 54′ N., Long. 87° 42′ W.*).

CAUTION. "*Northers*" *in Gulf of Tehuantepec.*—If one of these gales should be met, and sail can be carried, it is advisable to ease the sheets off and run well to the westward, without seeking to make northing; if obliged to heave-to, from two to four days' heavy weather may be expected, with a high short sea, a clear sky overhead, and a dense red haze near the horizon. It is said that if the summits of the Sierra Chimalapa are hidden about sunset by a slate-coloured vapour, a "Norther" will blow the following day; and if similar mists are seen on the ocean horizon at sunset, a south-south-westerly wind will blow the next day.

Route 1,382. Panama to San Francisco, or Juan de Fuca strait

See Route 1,381 (a) for general remarks on leaving Panama bay.

(a) June to January.—On leaving Panama bay, in order to gain the South-East Trade winds, steer during these months so as to pass northward of Archipielago de Colon (Islas Galápagos), keeping on about the parallel of 2° N. until the meridian of 105° W. is reached, when edge away to pass westward of Clipperton island, in the neighbourhood of which the North-East Trade will be met; then stand to the north-westward to cross the parallel of 20° N. in long. 120° W., and, if bound to San Francisco, stand to north-westward as far as lat. 35° N. in long. 135° W.; but if for Juan de Fuca strait, keep on to the north-westward as far as lat. 40° N. in long. 138° W., then haul in for the coast as the wind allows, remembering always to make the land to windward of the desired port.

(b) February to May.—Between and during these months cross the equator between Archipielago de Colon (Islas Galápagos) and the mainland, and run to the westward until westward of long. 105° W., and thence proceed as in (a) above.

Route 1,383. Panama to Australia or New Zealand

Cross the equator and pass southward of the Archipielago de Colon (Islas Galápagos) into the South-East Trades as in Route 1,381 (a) and Route 1,382 (b). When in the South-East Trade, run south-westward to cross the meridian of 120° W. in lat. 11° S. to 12° S. and then westward to pass southward of Iles Marquises and northward of Archipel des Tuamotu, and join Route 1,370 (a) (ii) from San Francisco in about lat. 14° S. or 15° S. on the meridian of 160° W. (*See* also Chart 5,308).

If bound to New Zealand, leave the route to Sydney in about long. 170° W. and proceed direct, noting that it is advisable, except when bound to Auckland, to pass down the west coast, and round the south of New Zealand, owing to the prevalence of westerly winds.

If conditions are favourable when off Cook strait, steer eastward through it to Wellington.

Route 1,384. Panama to Puerto de Guayaquil and ports southward to Callao

General remarks on passages from Panama to the southward.—These passages are all slow and difficult for a sailing vessel, on account of the contrary coastal current, running to the northward throughout the year, and the equally contrary light, but persistently southerly winds.

The general opinion appears to be that, if bound for ports along the coast southward as far as Callao, it is better to beat down the coast, as described below, but if bound to ports such as Mollendo, Iquique, Antofagasta, etc., it is better to make an offing into the trade winds, reach the coast by the westerlies southward of lat. 30° S., and then run northward with a fair wind and current to the desired destination.

(1) To PUERTO DE GUAYAQUIL.—From Panama bay make the best way south until between lat. 5° N. and the equator, and endeavour, if possible, to keep near the meridian of 80° W.; and then make a south-westerly course if the winds will allow. Should the wind be south-west stand to the southward, but if south-south-west stand to the west, if a good working breeze; if the wind be light and baffling, with rain, the vessel is in the doldrums, and should get to the southward as quickly as possible, taking advantage of every slant of wind to Puerto de Guayaquil.

(2) To CALLAO.—Having called at, or passed Puerto de Guayaquil, work close inshore to about the Islas Lobos de Afuera (*Lat. 6° 57′ S., Long. 80° 42′ W.*). *See* Caution on Currents and Fogs in the South America Pilot, Part III. Endeavour always to be in with the land soon after the sun has set, so that advantage may be taken of the land breeze, which however light, usually begins about this time; this will frequently enable a vessel to make way nearly along shore throughout the night, and be in a good situation for the first of the sea breeze.

After having passed the before-mentioned islands it would be advisable to work upon their meridian until the latitude of Callao is approached; then stand in, and if it be not fetched, work up along shore, as above directed, remembering that the wind hauls to the eastward on leaving the coast. Some navigators attempt to make this passage by standing off for several days, hoping to fetch in well on the other tack, but this will generally be found a fruitless effort, owing to the northerly current.

Route 1,385. Panama to ports between Mollendo and Valparaiso

Follow route 1,381 (a), according to season, for leaving Panama bay and then proceed as follows:—

(a) June to January.—From latitude 2° N., between June and January, stand to the westward, and pass northward of the Archipielago de Colon (Islas Galápagos), taking care to keep to the southward of 5° N. As far as long. 85° W. there will be south and south-south-west winds, but after passing that meridian the wind will haul round to the southward, and vessels bound to the South Pacific may be considered fairly in the trade. Then continue the passage as in (c) below.

(b) February to May.—In these months it is better to cross the equator between Archipielago de Colon (Islas Galápagos) and the coast before pushing to the westward. This may probably take a week, which outlay of time, however, is far preferable to encountering the vexatious weather met in that season north of the Archipielago de Colon. In this route it must be remembered that southward of latitude 1° N. the wind hauls to the eastward as the vessel leaves the coast, and in the meridian of 83° W. it is frequently found eastward of South. Continue the passage as in (c) below.

(c) Passage southward from Archipielago de Colon (Islas Galapagos). (See (a) and (b) above).—The routes northward and southward of Archipielago de Colon (Islas Galápagos) meet one another at a position in about lat. 20° S., long. 100° W.; and on reaching this point begin, if possible, to make southing and easting towards the coast, crossing lat. 30° S., in about long. 95° W.; and thence, as the westerly winds and north-going current begin more and more to be felt, and eventually the south-westerly and southerly coast wind, gradually head for destination, always arranging to make the desired port to the southward, on account of the current.

Route 1,386. Panama to Cabo de Hornos (Cape Horn)

Proceed as in Route 1,385 (a) or (b) (according to season), and (c) to the position in lat. 20° S., long. 100° W., and then continue standing to the southward, crossing lat. 30° S., between long. 102° and 103° W.; from this point or on reaching the westerly winds, gradually curve round towards the south-eastward, crossing the meridian of 90° W. at latitude about 50° S., being to the northward from September to November and to the southward from June to August. Round Cabo de Hornos as described in Route 1,083 (1).

See Route 1,375 for routes onward from Cabo de Hornos, and for a Note on Fogs.

Route 1,387.—*Reserved as spare.*

(v) ROUTES FROM SOUTH AMERICAN PORTS

Route 1,388. Callao to Panama or ports in Central America and Mexico

Stand northward along the coast with a favourable current, and a southerly wind. *See* Notes on winds and weather, and currents under Route 1,372.

To ports on the coast of Central America, northward of Panama bay, follow the general directions in Route 1,381 (b).

Route 1,389. Callao to San Francisco or Juan de Fuca strait

Stand out from the coast to pick up the South-East Trade, and then steer north-westward to cross the equator between long. 112° W. and 115° W., and lats. 5° N. to 7° N. in longs. 115° W. to 118° W., to join Route 1,382 from Panama.

Route 1,390. Callao to Australia or New Zealand

Steer westward in the South-East Trade to join Route 1,383, from Panama, in about lat. 12° S., long. 122° W.

Route 1,391. Callao to ports in China, Philippine islands, Japan, etc.

Steer westward in the South-East Trade to join Route 1,399 from Valparaiso in about lat. 12° S., long. 122° W.

Route 1,392. Callao to ports as far southward as Puerto Caldera or about Lat. 27° S.

(a) Usual route.—All of these ports lie within the area of the South-East Trade wind, and it is therefore recommended to work along shore, from Callao bay as far as Isla San Gallan, from whence the coast trends more to the eastward, so that a long leg and a short one may be made (with the land just in sight) to Rada de Arica (*Lat. 18° 29′ S., Long. 70° 21′ W.*) or to any of the ports between it and Bahia Pisco.

When proceeding from Callao to Bahia Pisco it is recommended to stand off the land at night, and towards it during the day until to the southward of lat. 13° S., when it is advisable to keep within 4 or 5 miles of the shore down to Bahia Pisco. The currents are uncertain at the Islas Chincha, but generally set to the northward at about one and a half knots.

(b) Alternative route.—A very dull sailer might do better by running through the trade and making southing in the offing, so as to return to the northward along the coast, than by attempting to work to windward against a trade wind which never varies more than a few points.

CAUTION. *Puerto Caldera.*—Care is necessary when approaching Caldera under sail without sufficient wind, as the current will tend to set the vessel on the rocks northward of Punta Francisco.

Route 1,393. Callao to Coquimbo, Valparaiso or Talcahuano

Bound to any of these ports there is no question but that by standing off the passage will be made in much less time than by working inshore, for a vessel may run quite through the trade and fall in with the westerly winds which are always found beyond it. Therefore, on leaving Callao bay, stand well out to the south-westward, as follows:—

(a) January to March.—Cross longitude 90° W., at lat. 18° S., and long. 95° W., at lat. 30° S. From this point, as soon as the westerly winds begin to be felt, steer eastward for destination; making the desired port to the southward on account of the current.

(b) During the rest of the year.—A lesser offing from the coast will suffice, and on leaving Callao bay, steer so as to cross long. 85° W. at lat. 18° S., and long. 90° W. at about lat. 30° S., and thence as above described, making to the eastward to destination.

Route 1,394. Callao to Cabo de Hornos (Cape Horn)

Follow Route 1,393, according to season, but on reaching the parallel of 30° S., continue on a southerly course so as to cross the parallel of 50° S. between longitudes 85° and 90° W., being to the eastward from September to November, and to the westward from June to August. Then steer to round Cabo de Hornos as described in Route 1,083 (1).

See Route 1,375 for routes onward from Cabo de Hornos into the Atlantic and Indian oceans, and also for a note on fogs.

Route 1,395.—*Reserved as spare.*

Route 1,396. Valparaiso northward to ports in South America

Keep straight up the coast. Calms and variable winds may be experienced in the vicinity of the parallel of 30° S., but southerly winds, and a steady north-going current will be experienced throughout the remainder of the voyage.

Route 1,397. Valparaiso to Panama and to Central American and Mexican coast ports

Stand to the north-westward, crossing the parallel of lat. 30° S. at about long. 77° W., and then standing northward till on the parallel of Callao (*Lat. 12° S.*), from which point keep at a distance of about 150 miles from the land until reaching Panama bay.

If bound to ports in Central America and Mexico northward of Panama proceed as described in Route 1,381 (b) from Panama.

Route 1,398. Valparaiso to San Francisco, Vancouver or Prince Rupert

The best route to pursue when making this voyage is the same at all times of the year. Leaving Valparaiso stand to the north-westward, passing to the eastward of Isla San Felix (*Lat. 26° 19′ S., Long. 79° 54′ W.*), and crossing the parallel of 17° S. in long. 90° W. After falling in with the South-East Trade wind steer to cross the equator in about long. 118° W. After falling in with the North-East Trade wind steer to cross the parallel of 20° N. in long. 138° W., the parallel of 30° N. in long. 142° W., and the parallel of 40° N. in long. 140° W. Continue the voyage as in (1) or (2) below.

Note.—In May and June the North-East Trade wind is often very weak north of lat. 20° N., and frequently a belt of calm exists between lats. 20° N. and 30° N.

(1) To SAN FRANCISCO.—Make to the eastward as soon as the westerly winds are met with, which will be from about lat. 33° N. during the winter months, to lat. 40° in the summer up to the end of August; making allowance for the south-east-going current.

(2) To JUAN DE FUCA STRAIT OR PRINCE RUPERT.—Make for either of these destinations on reaching the parallel of 40° N. at all times of the year; crossing the meridian of 130° W. at lat. 47° N. before steering direct towards the desired port. Prince Rupert may be approached either by Hecate strait, or westward of the Queen Charlotte islands. Allowance must be made for a south-east-going current, setting across the track, and attention is called to Cautions under Route 1,336.

Route 1,399. Valparaiso to Philippine islands, China or Japan

From South America the passage may be made by using either the North-East or the South-East Trades. These two routes are called respectively the *northerly* and the *southerly route.* The former is preferred by vessels leaving Valparaiso or Callao from August to February; the southerly is the better route during the remainder of the year. The dates are those of leaving South America.

(a) Northerly route.—August to February.—After leaving Valparaiso or Callao (routes from these ports joining in about lat. 12° S., long. 122° W.), steer through the South-East Trades so that the equator may be crossed in about long. 138° W., and lat. 10° N. in about long. 143° W.; the North-East Trades will be found near this parallel; thence continue as from North America, passing close to the southward of the Hawaiian islands, and joining routes from San Francisco as follows:—

(1) To PHILIPPINE ISLANDS.—Route 1,369.

(2) To CHINA.—Hong Kong and adjacent ports.—Route 1,367, or (via Manila), 1,369; Shanghai.—Route 1,368; Singapore.—Route 1,369.

(3) To JAPAN.—Nagasaki.—Route 1,368; YOKOHAMA.—Route 1,366.

(b) Southerly route.—March to July.—On leaving Valparaiso steer north-westward into the settled trades. These found, and being joined by the route from Callao in about lat. 12° S., long. 122° W., pass south of Îles Marquises and the Gilbert group, and to the northward of the Palau islands, to a position in about lat. 13° N., long. 130° E. At this point, join the "The Second Eastern passage" from the Eastern archipelago to China and Japan in the North-East Monsoon, eastward of the Philippines; and with the track from North America to San Bernardino strait (for Manila and Southern China during the South-West Monsoon). Bound to Yokohama leave

the route when southward of the Gilbert islands, cross the equator in about long. 168° E., and join the appropriate route from Sydney soon afterwards. *See* Chart 5,308 (in pocket at the end of this book) and Route 1,264.

Notes.—A description of "The Second Eastern passage," from the Palau islands onward, will be found in Sub-section A. (ii) of Chapter II. of Section C., Part II., on page 263, and in Route 1,138 for the passage through, or round the north of the Philippine islands.

See also Routes 1,367, 1,368 and 1,369 from San Francisco.

Leaving Valparaiso.—If there is a northerly wind on leaving Valparaiso, stand westward as long as it lasts and then north-westward into the South-East Trade. In the latitude of Valparaiso, during June, July and August, northerly winds occasionally extend far across the Pacific.

Route 1,400. Valparaiso to Australia or New Zealand

Steer to the north-westward to join Route 1,383 from Panama between the meridians of 120° W. and 130° W., and between the parallels of 10° S. and 12° S.

See Note regarding leaving Valparaiso under Route 1,399 above.

Route 1,401. Valparaiso or Talcahuano to the southward, and round Cabo de Hornos (Cape Horn)

The same rule prevails for making around Cabo de Hornos as that from Callao (Route 1,394), or from any of the West coast ports of South America, namely, make an offing first of between 500 and 600 miles to the south-west, until the westerly winds are steady and certain, and the strength of the north-east-going current is lost.

From Valparaiso or Talcahuano the point to make for is at about lat. 40° S., and long 84° W. Thence stand nearly south crossing lat. 50° S. in about long. 85° W. From this position, alter course gradually to the south-east and eastward to round Cabo de Hornos, which should be passed fairly closely during the summer months (December to February), but at about 80 miles distant in the winter months.

The summer months, December and January, are the best for making a passage from the Pacific to the Atlantic, though the passage is so short and easy that it hardly requires a choice of time. *See* also Route 1,083 (1). A summary of the routes onward from Cabo de Hornos is given under Route 1,375.

Note.—Making the land after rounding Cabo de Hornos.—The best way is to make the land westward of Cabo San Diego, in Tierra del Fuego, where the shore is free from outlying dangers. While a southwest gale is blowing the vessel can "lie-to" under easy sail in smooth water, and when the wind shifts to the north-west a good run may be made before the wind is again to the southwest. In the Estrecho de le Maire it is better to keep mid-channel, the overfalls off Cabo San Diego being very heavy at times. A vessel drifting from Cabo de Hornos towards Isla de los Estados (Staten island) in a southwest gale should run boldly through Estrecho de le Maire, haul up under the land of Tierra del Fuego, and wait for a shift of wind.

Anchorage.—Temporary anchorage is available in Bahia Buen Suceso (Good Success bay), about 9 miles southward of Cabo San Diego.

Routes 1,402 and 1,403.—*Reserved as spare.*

(vi) ROUTES FROM CABO DE HORNOS (CAPE HORN)

For directions for rounding Cabo de Hornos from the Atlantic ocean to the Pacific ocean, see Route 1,007 (8) *and* (9).

Route 1,404. Cabo de Hornos (Cape Horn) to Talcahuano or Valparaiso

After passing the meridian of 70° W. in about lat. 57° S., as described in Route 1,007 (9) (b), stand north-westward and then northward, keeping at a distance of about 150 miles from the land; begin to close the land at about lat. 40° S. Westerly winds and a favourable current will be met with from about lat. 48° S. to either destination. Make the port to the southward.

Note.—Some navigators prefer to stand further to the north-westward to about long. 80° W. or 81° W. in lat. 50° S., before turning northward and steering for destination.

Route 1,405. Cabo de Hornos to ports in South America northward of Valparaiso

After rounding Cabo de Hornos *(see Route* 1,007 (9) (b)), and bound to ports on the west coast of South America, and when west of the meridian of Cabo Pilar (or about 75° W.), take every opportunity of making westing until the meridian of 82° or 84° W. be reached; thence steer direct, or as nearly so as is consistent with making use of the steady winds which prevail in the offing, for the intended port, being careful not to get to leeward of it on approaching the land.

Route 1,406. Cabo de Hornos to Panama or ports in Central America and Mexico

Proceed as in Route 1,405 until reaching the meridian of 82° W. or 84° W., and then steer northward to close the land until it is about 60 miles distant when off, or just north of Guayaquil. After crossing the equator steer for Isla Galera (*Lat. 8° 30′ N., Long. 79° 00′ W.*), at the same time taking care, especially in the dry season, to stand inshore with the first northerly winds. By so doing, vessels will most probably have the current in their favour along the coast, whereas by keeping in the centre, or on the western side of the gulf, a strong southerly set will be experienced.

After making Galera and clearing the Banco San José, the navigation between the Archipielago de las Perlas and the mainland is clear and easy, with the advantage of being able to anchor, should the wind fall and the tide be against the vessel. As a rule this passage should be taken, but with a strong southerly wind the navigator is tempted to run up the bay, in which case he should keep towards the western side of the Archipielago de las Perlas, where anchorage and less current will be found should the wind fail, an event always to be expected in these regions.

Bound to ports in Central America or Mexico, northward of Panama bay, proceed generally as described in Route 1,381 (b).

Route 1,407. Cabo de Hornos to San Francisco and ports to the northward

(1) To San Francisco.—Having rounded Cabo de Hornos as in Route 1,007 (9) (b), stand to the north-westward so as to cross the parallel of 50° S. between long. 80° W. to 85° W., and then due north to lat. 30° S. Thence keep off to the north-westward, running through the South-East Trades to cross the equator between longs. 112° and 115° W. being to the eastward, throughout the whole voyage from Cabo de Hornos, from September to November; and to the westward, from June to August.

After crossing the equator, steer so as to cross long. 120° W. in lat. 13° N. to 15° N., and from this point the route divides into two branches, according to season, as follows:—

(a) November to February.—Make to cross lat. 30° N., in long. 132° W., and from that point, when the westerly winds are met, curve gradually round towards San Francisco, making it to the northward, and allowing for the current setting to the south-eastward across the track.

(b) March to October.—Make so as to cross lat. 30° N. in long. 137° W. and turn towards the land when the westerly winds are reached at about lat. 35° N.; again allowing for the south-east-going current across the track.

(2) To COLUMBIA RIVER, JUAN DE FUCA STRAIT OR PRINCE RUPERT.—Take the same route as in (1) (a) or (b) above as far as lat. 30° N.; then continue to the north-westward, curving to the eastward on reaching, or nearing the parallel of 45° N., to make destination, allowing for the current as in (1) (a) or (b).

Route 1,408. Cabo de Hornos to Honolulu

Follow Route 1,407 as far as lat. 30° S. or, if necessary, a little further northward to enter the South-East Trade wind; then proceed as directly as possible, crossing the equator between longs. 120° W. and 125° W.

Route 1,409. Cabo de Hornos to Philippine islands, China, Japan, Australia or New Zealand

Follow Route 1,407 as far as lat. 30° S. and then run in the South-East Trades to a position in about lat. 12° S., long. 122° W. to join routes as follows:—

(1) To PHILIPPINE ISLANDS, CHINA OR JAPAN.—Route 1,399 from Valparaiso.

(2) To AUSTRALIA OR NEW ZEALAND.—Route 1,383 from Panama.

Route 1,410. Cabo de Hornos to Pacific islands

Take Route 1,407 as far as lat. 30° S. and then continue as follows:—

(1) To TAHITI.—Run west-north-westward in the South-East Trades until the parallel of 25° S. is reached and thence proceed direct to destination, passing southward of Pitcairn island.

(2) To ISLANDS IN THE WESTERN NORTH PACIFIC OCEAN.—Follow Route 1,409 as far as lat. 12° S., long. 122° W., to join Route 1,399 (a), the northerly route from Valparaiso to the Philippine islands, etc. Leave this route in about long. 175° E. if bound to the Marshall islands, or in about long. 160° E. or 165° E. if bound to the Caroline islands or islands farther westward, and proceed direct to destination.

Note.—The route to Honolulu is given in Route 1,408.

(3) To ISLANDS IN THE WESTERN SOUTH PACIFIC OCEAN.—Proceed either via Tahiti, as in (1) above, and thence, after getting on about the parallel of the destination, run direct; or alternatively, take Route 1,409 (2) as far as about long. 160° W., and then proceed direct to destination.

See Section D. Part III. Index on pages 357 and 358.

Section C

SAILING-SHIP ROUTES

Route Index

This index is designed to enable the mariner to see at a glance whether, and where, a description of a sailing-ship route from any port, island, etc. to any other port, island, etc. is to be found in this section of the book. The lay-out of the index is as follows:—

In the left-hand column, the names of the ports, etc., **from which** are described, are printed in **bold type** in alphabetical order. In the same column, offset from each port, is an alphabetical list of all ports, etc., to which routes are described in the text of the book. The number of the route and the page on which it will be found, follow in the next two columns.

Example:—

Route	Route Number	Page
Mauritius		
Adelaide, see Australia, Ports in	1105 (1)	245
Aden	1108	245
Australia, Northern	1105 (2)	245
Australia, Ports in	1105 (1) and (2)	245
Bengal, Bay of, see Indian ports	1107	245
etc. etc.		
Melbourne		
etc. etc.		

When a destination port, etc. is not mentioned in the title of the route as printed in the text, it is shown in italics in the index. Italics are used also where a route passes close to a port or island which is not specificially mentioned in that route, but which is still of sufficient importance to justify a note in the index. In the above example South Australia appears in the title of Route 1,105, while "Adelaide" does not; the latter is printed therefore in *italics*.

In a few cases the port of departure is printed in *italics*. This indicates that no route title appears under the name of such port, but that a through route passes sufficiently close to justify its inclusion in the index, e.g., *Madeira*. The off-set names (*also in italics*) in this case are the destinations in the route in column 2.

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Section D

NAVIGATIONAL NOTES AND CAUTIONS

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An Index to the relevant Notes and Cautions is printed at the beginning of each part of this Section.

SECTION D

INTRODUCTORY REMARKS

The great majority of the Notes and Cautions in this Section are collected together from those already printed in Sections B. and C.; a few, however, have been extracted from various volumes of the Admiralty Sailing Directions.

The general principle adopted has been to reprint only such Notes and Cautions which apply to routes other than that under, or in, which it is already printed in Sections B. and C.; or, in other ways, are of general interest to the navigator.

It must be borne in mind that these Notes and Cautions and the paragraphs on Winds and Weather, Currents and Ice in Section A. and Chapter I. of each Part of Section B., together with the Directions, Notes and Cautions in Sections B. and C. are in general terms only. It cannot be over-emphasised that the Navigator must consult the appropriate volume of the Admiralty Sailing Directions, together with the Atlases, Books, Charts, etc. mentioned in Section A., to obtain full details of the conditions and obstacles likely to be met on any route.

Section D. is divided into three Parts, viz., Part I.—Atlantic ocean and Mediterranean sea; Part II.—Indian ocean, Persian gulf and Eastern archipelago; Part III.—Pacific ocean. Each Part is provided with an index of the Notes and Cautions affecting the relevant ocean or sea. In the case of places bordering on two oceans or seas, the Notes and Cautions are printed in one Part and a suitable reference made in the other Part affected.

The Notes and Cautions are grouped under titles representing the coast of a country or continent, a sea, bay or channel, or even (in a few cases) individual ports or islands; e.g., United States West coast (Part III.); South America East coast (Part I.); Bay of Biscay (Part I.); Eastern archipelago (Parts II. and III.); Gibraltar (Part I.). These titles, which are printed in capital letters, are arranged alphabetically in each Part.

Included in this Section are a number of " Passages " which are useful for other routes than that under which they are printed; being collected together, reference is made more simple.

Where a Note or Caution refers to one class of vessel only—or even mainly—*steamship* or *sailing-ship* is printed in italics after, or under, the title.

Where Navigational Notes are too long to be re-printed in Section D., but in view of the number of routes affected, are of more than strictly local interest, a reference is given to the place in which they may be found, e.g. Eastern archipelago in Section C., Part II., Chapter II.

Numbering of Notes and Cautions.—Unless there is one Note or Caution only under a group title, the latter are not numbered. The numbering of the Notes and Cautions is consecutive throughout the Section, but spare numbers are provided at the end of each Part.

The numbered Note and Caution titles (except in the case of group titles) are printed in bold type, while the titles of the subsidiary (unnumbered) notes, etc., are printed in italics. An example taken from Part III. under the group title **AUSTRALIA EAST COAST** follows:—

Great Barrier reef—Inner and Outer routes

107. **Steamship routes bound northward**

General remarks.—Vessels proceeding, etc., etc.

(*a*) *Inner route.*—The Inner route, etc., etc.

108. **Steamship routes bound southward.**—Follow, etc., etc.

109. **Sailing-ships bound northward.**—It is not, etc., etc.

(*a*) *The Outer route.*—The Admiralty, etc., etc.

References in Sections B. and C.—Where a Note or Caution printed in Section D. applies to any route described in this book, a notation (*in italics*) is made at the bottom of the appropriate page in Sections B. and C., thus:—*See Section D. Part I. Index on pages 340 and 341.* The index should be consulted for Notes and Cautions affecting ports, islands, etc. adjacent to as well as those mentioned in, the various routes.

Indexes.—An index is printed at the beginning of each Part; it is in alphabetical order of groups. No explanation of the index is required except that the group titles are printed in bold type, from which the Note and Caution title is off-set. The subject of the Note or Caution (Fisheries, Fog, Sailing-ship passages, etc.) is also indicated.

PART I

ATLANTIC OCEAN AND MEDITERRANEAN

Index

For Notes on Winds and Weather, Currents, and Ice *see* Section A. and Chapter I. of Parts I. and II. of Section B. The appropriate volume of the Admiralty Sailing Directions should always be consulted for local and more detailed information regarding the above; and also before approaching any coast, island or port.

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NOTES AND CAUTIONS

1. BAY OF BISCAY. *See also* English Channel (Fisheries).

Current—Weather—Fog—After westerly gales there is always a strong easterly set of current into the Bay of Biscay, and towards Cabo Finisterre and the west coast of Spain and Portugal, sometimes as much as 2 knots. An onshore wind brings cloud that develops into fog or thick mist when it reaches the elevated land at both the northern and southern points of the Bay.

2. Ushant

Passage southward.—Steamships on leaving the Channel, steer so as to pass between 30 and 40 miles westward of both Ushant, and Cabo Finisterre. Though these two points may be passed safely at a lesser distance in definitely fine weather, there is little mileage saved by so doing; and by taking the outer route as above, a vessel will be clear of the homeward bound traffic from the Mediterranean, which usually follows the inner route.

3. Passage northward.—Steam vessels approaching the English channel from the southward often close Ushant to make it and ascertain their position before proceeding up channel, but the gain in distance by steering from off Cabo Villano to a point 10 miles westward of Ushant, instead of 40 miles westward, is, if making the Start, only 5 miles; or if making Portland Bill, 8 miles, in a distance of 530 miles.

Mariners approaching Ushant (*Lat. 48° 28′ N., Long. 5° 08′ W.*) must guard against the danger of being set eastward of their reckoning, and should use the greatest caution in passing it. The island is surrounded by dangers; rocks are numerous and far from the land; fogs and thick weather are common, the tidal streams are strong, and the extent of their influence seawards undetermined; no dependence can be placed on seeing the lights, although they are very powerful, or hearing the fog signals. In thick weather the island should be given a wide berth, and continuous sounding resorted to, and a depth maintained exceeding 60 fathoms (109^{m}7), allowing for the rise of the tide.

In settled fine weather Ushant may, however, be rounded at a distance of about 10 miles.

4. Fog-banks in the offing—*Caution.*—It is not always possible to determine from the land the existence of fog-banks in the offing. Also, it is known that large areas of silence exist round many fog signal-stations, so, although the lights and fog-signals of Ushant are of great power, no confidence can be felt in thick weather in seeing the lights, or hearing the fog-signal.

5. BERMUDA.—*Sailing-ships.*—When approaching the islands every opportunity should be taken to verify the vessel's position, and should it be at all doubtful and the weather unfavourable for seeing the lights, the parallel of the islands should not be crossed during the night, for the 100-fathoms (182^{m}9) contour line is too close to the reef for sounding to give warning.

CANADA

6. North Atlantic Lane Routes.—The large number of steam vessels crossing the Atlantic, and their high rates of speed has necessitated the adoption of clearly defined separate routes to be followed by outward and homeward bound ships; such routes to be adapted to the ice conditions most probable at different periods of the year. These are known as the *North Atlantic Lane Routes*, and are shown in full detail on Admiralty Charts Nos. 2058b and 2058c, the former showing tracks from the English channel and southward of Ireland to Canada and the United States, and the latter showing tracks from northward of Ireland to Canada and the United States. These " lane routes " have been given a letter for simplication of reference; they are described in general terms below.

These routes are recommended for all classes of steamers, both high-powered, moderate, and low-powered; but masters of all ships—both steamers and sailing ships who do not, or cannot make use of the " lane routes," should make themselves acquainted with them for their own safety as well as that of the other vessesls which do use them.

Vessels, by following these routes, not only reduce to a minimum the danger of collision with each other or with ice (always one of the chief dangers of this navigation), but in case of a breakdown of machinery are almost certain of receiving assistance from other vessesls following the same route.

The date on which tracks change is to apply to the meridian of Fastnet for westbound vessels and the meridian of 70° W. for eastbound vessels.

Caution. Westbound ships must take care not to pass to the southward of the authorised tracks; eastbound ships should not pass to the northward of their authorised routes.

Special tracks, west-bound or east-bound, will be agreed by telegraphic communication between the companies when varying circumstances, owing to abnormal conditions, may make such special tracks advisable. These special tracks, or alterations in the dates of using certain " lane routes " are notified by Notice to Mariners and the latest Notice on the subject should be consulted.

7. Canadian Optional tracks.—Vessels bound to or from United States ports from or to the north of Ireland have the option of following either the United States or the Canadian seasonal tracks, " D," " E " and " F," remaining on track " F " during the operative dates of track " G."

> On tracks " E " and " F " vessels should pass 40 miles southward of Sable island when westbound, thence to a position close southward of Nantucket; and when eastbound should steer from position lat. 40° 10′ N., long. 70° 00′ W. to position 60 miles southward of Sable island.
>
> On track " D," westbound vessels should proceed by Rhumb line from position lat. 43° 00′ N., long. 50° 00′ W. to position close southward of Nantucket; and when eastbound, from position lat. 40° 10′ N., long. 70° 00′ W. to position lat. 42° 00′ N., long. 50° 00′ W.

Masters of vessels encountering ice, have permission to deviate from these tracks, and, after the end of October, to leave the Belle Isle route for the more southerly route at their discretion, according to weather conditions. Should vessels on Track " C " bound to or from the United States be deviated to Track " B " on account of ice, Canadian vessels will remain on Track " D " for the period prescribed, but will have the option of deviating as necessary in the vicinity of ice areas.

8. United States Optional tracks.—Vessels bound to or from United States ports calling at Halifax have the option of following either the Canadian or the United States seasonal tracks to or from that port, passing 40 miles southward of Sable Island when westbound and 60 miles southward of Sable Island, eastward, when proceeding on United States tracks, and Canadian track " D." When proceeding on

Canadian tracks " E " and " F," via Halifax, vessels pass northward of Sable island both westbound and eastbound.

Vessels bound to Portland (Maine) may follow the Canadian seasonal tracks.

9. Newfoundland Coasts

Currents. As fog is exceedingly prevalent off the south coast of Newfoundland, especially during June and July, vessels should guard against the set of the current and the indraught into the deep bays.

When approaching from the eastward in thick weather, the Ballard bank, which extends 15 miles about parallel to the shore is nearly sure to be crossed, and a careful comparison of the soundings with those on the chart will show the position of the vessel with sufficient accuracy to enable the navigator to round Cape Race.

Although the current between the Great bank and Newfoundland is ordinarily to the south-westward, sometimes at a rate of nearly one knot, it is not invariably so, and near the shore in moderate weather it changes with the tide and runs at a weaker rate in the opposite direction.

Westward of Cape Race, the current setting to the north-westward at the rate of about one knot, normally is affected greatly by the prevailing winds. It normally runs in upon the eastern side of the great bays indenting the south coast of Newfoundland, and out upon the western. In the offing it is influenced by the winds, and near the shore it is altered and influenced by the tides, so that during spring tides the stream of ebb runs weakly to the south-eastward, and the stream of flood to the north-westward, the latter sometimes at the rate of two knots round the headlands.

Soundings. When approaching and passing Capes Race and Pine vessels should obtain frequent soundings.

Approaching from the eastward, after crossing Great bank, the water deepens to about 100 fathoms; it then shoals on Ballard bank, and after again deepening to 40 fathoms, shoals gradually to the shore.

Approaching from the westward, in thick weather vessels should not close Capes Pine and Race into depths of less than 30 fathoms.

Ice.—There may be icebergs off this coast at nearly all seasons. In March, April, May, June, and sometimes July, field ice is often encountered, either on the banks or nearer to Newfoundland. The earliest recorded time of the arrival of northern ice at Cape Race is 17th January, and the latest, 12th April; the average time is about the first week in February. The time of the clearance of the ice varies from 25th February to 7th June; the average time is about the middle of April.

Magnetic Variation. — The magnetic variation changes rapidly on the coasts of Newfoundland and Labrador. This change amounts to one degree in about 70 miles in the vicinity of Cape Race, in about 37 to 55 miles on the west coast of Newfoundland, and in about 60 miles near the Straits of Belle Isle.

The deviation of the compass should be ascertained when approaching Newfoundland, as the large scale of magnetic dip and the small horizontal force in this region may cause the deviation to be different from that determined in other places.

In many parts of Newfoundland and Labrador local magnetic anomalies affect compasses on shore. Although it is not possible that these distrubing forces can extend to vessels navigating off the coasts, areas of disturbance may exist in places at the bottom of the sea, and may affect the compasses of vessels when in shallow water. Actual experiences of this kind have occurred, but they are not common. In water exceeding 50 fathoms (91^{m}4) in depth no effect has been observed.

10. Cabot strait. — Steam vessels proceeding through Cabot strait in the spring, and with clear weather, should pass the signal-station on Galantry head, St. Pierre island, within signalling distance, and obtain information as to the state of the ice; or, failing this, obtain the information either from the signal-station on Cape Ray, or that on St. Paul island. After the ice has disappeared, generally about the end of May, they should keep farther off Galantry head, to avoid the dense fog that prevails in that locality during June and July; and should guard against the strong current that occasionally sets into the bays on the south coast of Newfoundland; in fact, during this period, it is better to be nearer St. Paul island than Cape Ray. *See* Newfoundland and Labrador Pilot.

11. Hudson bay.—*Magnetic Compass.*—The directive force of the magnetic needle is weak on the northern routes particularly in Hudson strait and in Hudson bay.

CAPE HORN. *See* Hornos, Cabo de

CAPE TOWN

12. *Steamships approaching from the northward.*—When approaching Cape Town it is advisable, when circumstances permit, to close the land off Great Paternoster point (*Lat. 32° 45′ S., Long. 17° 52′ E.*), and to pass southward between the land and both Dassen island and Robben island. By so doing, assistance will be received from the southward-setting counter-current, which sets along the coast at this point; while the main current, setting northward at a little distance westward of these two islands will be avoided. The direction and strength of the currents experienced when approaching Cape Town from northward or westward are, however, stated to be subject to much variation, and an inset into Table bay and towards the coast northward of it as far as Paternoster point is sometimes experienced.

13. *Sailing-ships approaching Cape Town or Simons bay from the westward.*—Coming from ports in the Atlantic ocean it is recommended that the meridian of Greenwich should be crossed in about lat. 35° to 37° S.; or from Cabo de Hornos (Cape Horn) in about lat. 40° S.

After passing the meridian of Greenwich, a strong northerly current will be frequently experienced; and on nearing the land, when bound to Table bay, great attention is required, as there it will be found almost constantly running strongly to the northward, and, if disregarded, a vessel may have difficulty and lose time in reaching the bay. If bound to Simons bay during the southern summer months, it will be better to make the land about Cape Hangklip, as a strong current sets at that period across the entrance of False bay towards Cape point.

Approaching the Cape of Good Hope from the westward, if the weather be clear, Cape point light should be sighted at the distance of about 23 miles, but caution is necessary in hazy weather.

If near the coast at night, and the land is not visible, keep to the south-westward until the position is ascertained.

Note.—As the wind seldom, if ever, blows from the east or north-east (*i.e.*, directly off the peninsula), sailing vessels bound either for Table bay or round the Cape of Good Hope, should ensure a weatherly position to the north or south, according to the season of the year. Those for Simons bay have been detained many days by south-easters off the Lion's head and Hout bay, in consequence of their making the land too far to the northward during the summer season. The same winds would have been fair for them had they been 30 miles farther south. On the other hand, a vessel bound for Table bay in the winter season will find it difficult to make her port from a position off Cape point, during the continuance of north and north-west winds, notwithstanding the general prevalence of north-north-westerly current.

CAUTION. Under any circumstances, at night, there is great difficulty in judging the distance of lights situated under high land. Therefore, the prudent course for a stranger to pursue when making Table bay is to keep off and on until daylight, sufficient to the westward of Green point to prevent being becalmed near the land and set in upon the coast by the heave of the sea.

CAPE OF GOOD HOPE

14. Rounding the Cape from westward to eastward (*Sailing-ships*).—Having crossed the meridian of Greenwich in lat. 40° S., steer along that parallel until joined by the routes from Cape Town to ports in the Indian ocean. *See* Routes 1,091 to 1,098 inclusive.

Rounding the Cape of Good Hope from eastward to westward (*Sailing-ships*).—*See* Note and Caution No. 70.

CARIBBEAN SEA AND GULF OF MEXICO.

15. Sailing ships.—For notes on routes for these vessels *see* Route 1,006 and Routes 1,062 to 1,069 inclusive.

16. Steamships.—General Notes

(1) The Routes between ports in these waters are all as direct as navigation permits, with one exception, due to seasonal changes in the direction of the currents in the Strait of Yucatan, namely, on a passage from New Orleans to Colon, from September to April, when Cabo San Antonio (western extreme of Cuba) should be rounded as closely as navigation permits, but from May to August it should be passed at about 20 miles distance.

(2) On the passage from Colon to New Orleans the route through Yucatan strait is, at all seasons, on the opposite side of the channel; namely, at 40 miles distance from C. Catoche, and the eastern extreme of Yucatan perinsula.

(3) Bound to and from the southern Mexican oil ports, pass southwards, both ways, of Arrecife de Alacranes (Alacran reef) (*Lat. 22° 24′ N., Long. 89° 42′ W.*).

(4) Bound eastward from the oil ports through the Caribbean sea to the West Indian islands, or to South America, give Cabo Catoche a wide berth, and make Cabo San Antonio (western extreme of Cuba) at a distance of 7 miles. Shape course thence along the southern side of Cuba, to sight Cabo de la Cruz, passing it at about 5 miles distance; and thence pass the same distance from Navassa island (*Lat. 18° 25′ N., Long. 75° 02′ W.*) and from Pointe de Gravois (*Lat. 18° 02′ N., Long. 73° 56′ W.*), and Alta Vela (*Lat. 17° 29′ N., Long. 71° 39′ W.*), all off the south side of Haiti-San Domingo. This course will keep a vessel in a slight east-going countercurrent; and also mostly under the lee of the land, in smooth water.

(5) If bound to South America from Alta Vela, steer to pass between St. Lucia and St. Vincent islands, and southwards of Barbadis to a point in lat. 9° 00′ N., long. 53° 00′ W., and thence to round Cabo de San Roque at a distance of 50 miles.

(6) On the return journey from South America, keep in the strength of the Gulf stream from a point 20 miles from Cabo de San Roque, rounding Cabo Orange at a distance of 50 miles, and passing north of Jamaica to the Yucatan strait. Cabo Catoche must, as before, be given a wide berth, on account of the off-lying shoals.

(7) If bound to Tuxpam or Tampico, after passing south of Arrecife de Alacranes, steer to pass northward of Cayo Arenas.

CAUTION. The currents around Tuxpam reefs are very uncertain, and at night time, unless Tuxpam lights are in sight, it is not prudent to approach the shore into less than 15 fathoms of water.

(8) If bound to Coatzacoalcos, pass 7 miles west of the charted position of Snake rock, and 5 miles north of Cayos Arcas. Thence proceed direct to destination, always allowing for the current setting towards the shore, on approaching Coatzacoalcos.

(*See* pilot chart of the Central American waters for each month of the year published by the Hydrographic Office of the Navy Department of the United States, on which all routes and distances are laid down).

General.—All vessels proceeding from ports in the Gulf of Mexico to ports in British Isles or Europe should first make for a point off the Dry Tortugas, in lat. 24° 25′, long. 83° 00′ W., as directly as navigation permits.

17. Mississippi river approach.—*Caution.*—The currents in the neighbourhood of the mouth of the Mississippi are very uncertain, fog and haze are very prevalent, especially in summer and autumn, the mud banks are very low, and the wind generally from the eastward. Soundings should be obtained well to windward. If approaching from the southward or south-westward, great attention should be paid to checking the latitude, for the bank is so steep that the first cast may be 35 fathoms (64^{m}0) only 3 or 4 miles from the South pass.

18. Providence channels.—Directions for the navigation of Providence channels and Florida strait will be found in West Indies Pilot, Vol. III. It should be noted that North-east Providence channel is also known as " Hole-in-the-Wall passage," and that the Providence channels jointly are sometimes referred to as the Abaco passage. *See also* Route 88.

To ports in the Gulf of Mexico, the North-West Providence channel is used by a great number of vessels, keeping on the edges of the banks, to avoid the strength of the current. The Old Bahama channel is also used, but less commonly.

19. Spanish Main.—*General navigational note.—Along the coast of the Main.*—Full-powered and most other steam vessels make the direct passage between the various ports on the Main in the West Indies, keeping near the shore where possible when making the passage from west to east, and keeping off-shore, in the prevailing current when proceeding from east to west. Proceeding from Trinidad, westward, the route (taken by the mail steamers) is well southward of the Cumberland bank and other dangers southward of Islas Testigos; thence between Los Frayles and Isla Margatira, and southward of Curaçao and Aruba.

From Trinidad to Demerara, keep as close to the coast as is safe, in order to avoid the current. From Galera point light, steer to a point 30 miles north of Demerara light vessel, and on reaching it, make directly for the light vessel. Keep a good look-out for land. Generally, the first marks to be seen, are the wireless masts eastward of the river entrance. These are usually sighted before the lightship is seen.

The currents are strong and very uncertain, and continuous sounding is very necessary; for if a ship should be set to the South-westward, it is possible for her to ground before sighting land.

20. Windward islands.—*Passages through.*—The channel between Antigua and Guadeloupe islands is 30 miles wide, and there is generally much less current here than farther north or south. It will be better, however, in using this channel, to keep the Antigua shore on board, and to sight the island on the parallel of lat. 17° N. Vessels sometimes pass between Antigua and Barbuda islands; this may be done without much risk in the daytime, but by no means in the night, for the soundings are so irregular that in running down it would be difficult to tell whether to haul northward or southward.

CAUTION.—Before navigating along this coast, a careful study should be made of the information contained in the Admiralty Sailing Directions and Charts.

21. ENGLISH CHANNEL.

Directions for the termination of the routes to the Irish sea, the Bristol channel and the English channel will be found in the Irish Coast, the West Coast of England, and the Channel (Part I) Pilots, but special attention is drawn to:—

22. **Fisheries.**—*Trawling.*—Trawling is carried out within the 300 fathom ($548^{m}6$) line off the south-west and south coasts of Ireland down to lat. 49° 00′ N. all the year round, though chiefly in the autumn.

Trawling is carried on throughout the year from the Scilly isles to the Bay of Biscay, and even farther southward. Fishing fleets are generally in the line of traffic between Land's End and the Lizard.

Care should be taken to pass a single trawler at a distance of at least one cable; passing to windward, on account on the trawl being towed from the weather quarter.

Drift net fishing.—Drift net fishing is carried out a long way off the south-west of Ireland from April to June, and closer inshore, off the south-west and south coasts from May to November.

Drifters may be met off the Cornish coast between March and September. They are usually met with in large clusters, sometimes of many hundreds of boats covering 40 to 60 square miles of sea. They should, if possible, be avoided altogether. If possible, propellers should be stopped while passing over nets.

For further information on Fishing boats, *see* Channel Pilot, Part I.

23. **Currents.**—It is necessary, in shaping a course from or to the entrance to the Channel to take into consideration the present, and lately prevailing winds and weather, in order to make allowance for the set of the swell, and influence of current.

This requires great judgment, for the currents of these seas are merely the prolonged movement of the water resulting from recent gales; and their actual direction may differ from the direction indicated by the set of the swell.

After south-westerly, or westerly gales, a current setting towards the mouth of the Channel may be expected; the rate dependent on the strength and continuance of the preceding gale and on the distance at which it passed.

When, however, strong or long continued westerly winds have prevailed westward of the northern coast of Spain, an outset from the northern part of the Bay of Biscay may be expected, flowing obliquely across the fairway of the entrance to the Channel, setting a vessel to the north-westward. This current is not frequent in occurrence, but it may attain a rate of 1½ knots, and the knowledge of its existence should induce great caution. It has been known to be felt past Land's End as far as the Bristol channel.

The months of the year during which it may be expected are from October to February, inclusive.

For information as to Tidal Streams, *see* Channcl Pilot, Part I.

24. FALKLAND ISLANDS.—Ice.—For most of the year the mean limit of icebergs lies well to the south-east of the Falkland islands, but during the months of November and December the mean limit runs through the Falkland islands, from about 100 miles south-east of Cabo de Hornos to about lat. 43° 00′ S., long. 52° 00′ W., before turning eastwards to pass about 500 miles south of the Cape of Good Hope. Icebergs north and west of this mean limit are, however, frequently found at all times of the year, and the risk of meeting icebergs when on passage to or from the Falkland islands, Estrecho de Magallanes, and Cabo de Hornos must be considered ever present. (*See* Antarctic Pilot and South America Pilot, Parts I. and II.; also Chart 1,241, Ice Chart of Southern Hemisphere).

GIBRALTAR, APPROACHES TO

25. Steamships and Sailing-ships (with a fair wind). —*Bound eastward.*—A vessel approaching Gibraltar strait in thick weather may assure her safety by sounding. With clear weather, there is no difficulty, as no shoal lies more than 4 miles from the land; but with thick weather, caution is necessary, the currents, tidal streams and eddies between Cape St. Vincent and Isla de Tarifa being very variable. Cape Spartel is safe to approach.

In going through the Strait of Gibraltar, keep in mid-channel, as the current is nearly always setting to the eastward there. Along the shores, tidal streams are developed which run west with a rising tide and east with a falling tide. The easterly current in the middle is rarely overcome by the westerly stream, but during easterly winds and calms, it is always retarded, and occasionally reversed.

Bound westward.—When bound westward through the Strait of Gibraltar attention should be paid to the tidal streams. The prevailing east-going current in the middle of the strait may be largely avoided by keeping close to either shore, preferably the Spanish; but the tide races which occur off many salient points on both shores should be avoided, especially by small ships. *See West Coast of Spain and Portugal Pilot.*

26. Sailing-ships (Working through the Strait).—*Bound eastward.*—With an easterly wind work in mid-channel to have the advantage of the current whilst the west-going tidal stream is running, but with the east-going stream either shore may be approached, with a chance of meeting favourable slants of wind; if it is blowing fresh, a vessel will (especially if she be able to gain the meridian of Cabo de Plata or Malabata point) get through the strait, provided she keep in mid-channel and can carry at least her topsails (even close reefed). When Tarifa is passed, the force of the wind lessens. If the easterly wind is so strong as to prevent a vessel carrying sail, take shelter under Cape Spartel, keeping under easy sail to await a favourable change.

When the easterly wind inclines to the northward, it is advisable to keep on the Spanish coast, avoiding Pearl rock (La Perla) but when to the southward, the African coast is preferable.

Bound westward.—The passage through the Strait of Gibraltar from east to west against the general easterly current from the Atlantic is, even with a fair wind (especially during neap tides), somewhat difficult for sailing vessels, but with westerly winds, which increase the strength of the current, it is, for a large ship, almost impossible. For directions for working through the Strait. *See* Route 1,015.

27. HORNOS, CABO DE (CAPE HORN) AND APPROACHES.—Steamships passing from the Atlantic ocean to the Pacific ocean or vice versa use Estrecho de Magallanes (Magellan strait). Sailing-ships should not use this strait but should round "The Horn"; directions and Navigational Notes on the passage for these vessels, from east to west and from west to east, are given below.

28. Fogs.—These are rare on the coast of Tierra del Fuego and in the vicinity of Cabo de Hornos (Cape Horn), but thick rainy weather prevails, with strong winds, the sky in moderate weather being generally overcast and cloudy; a clear day is a rare occurrence.

29. Ice.—Ice may be met with eastward of Cabo de Hornos and the Falkland islands at all times of the year, but is most common between October and February, which are the most favourable months for rounding Cabo de Hornos from west to east.

The mean ice limit for this region trends north-eastwards from Cabo de Hornos, through lat. 50° S., long. 52° W., as far as lat. 40° S., long. 35° W., but icebergs have been met with as far west as the Falklands; northward of 40° S. they are rare, but a good look-out should still be kept for them.

Numerous icebergs and extensive icefields have also been seen different times in the space south-eastward of the above limit. Some of these icebergs have exceeded 20 miles in length, and were very numerous in 1892, 1893, and 1894. In 1906 numerous icebergs were seen north-westward of the above limit; in long. about 56° 30′ W. they extended from lat. 50° to 45° 30′ S.

Icebergs should, if possible, be passed to windward to avoid the loose ice floating to leeward.

30. Passage from the Atlantic ocean to the Pacific ocean (*Sailing-ships*).

(*a*) *Usual route from the northward.*—Bound around Cabo de Hornos (Cape Horn), without calling at any intermediate port, the usual track is to take as direct a course as possible from the position 200 miles eastward of Rio de Janeiro to about lat. 45° S., long. 60° W., and from thence so as to pass 30 to 40 miles eastward of Isla de los Estados (Staten island). (*See* CAUTION at the end of (b)). This track lies between 120 and 200 miles eastward of the Patagonian coast, and is the most direct route for a large and well-found ship. The older navigators, however, recommend that sailing ships should keep within 100 miles of this coast, in order to avoid the heavy sea that is raised by the westerly gales and to profit by the variableness of the inshore winds when from the westward.

Near the coast from April to September, when the sun has north declination, the winds prevail more from W.N.W. to N.N.W. than from any other quarter. Easterly gales are of very rare occurrence, and even when they do blow, the direction being obliquely upon the coast, it is not hazardous to keep the land aboard.

From October to March, when the sun has south declination, though the winds shift to the southward of west, and frequently blow hard, yet as it is a weather shore, the sea goes down immediately after the gale. The winds at this time are certainly against making quick progress, yet as they seldom remain fixed in one point, and frequently shift backward and forward 6 or 8 points in as many hours, advantage may be taken of the changes so as to keep close in with the coast.

(*b*) *Passing Isla de los Estados* (*Staten island*) *and Estrecho de le Maire* (*Le Maire strait*).—The usual course, suitable for all times, is to pass eastward of the island; there are, however, several advantages in passing to the westward of the island, through Estrecho de le Maire, which may be enumerated as follows:—

(i) It is the shortest route round Cabo de Hornos, and a vessel on emerging from the strait will stand easily 60 miles further on her course than when in the same latitude outside Cabo San Juan (Cape St. John), Isla de los Estados; a very sensible gain when the difficulties attending the making of westing in these latitudes is taken into account.

(ii) A further advantage is that between the strait and Cabo de Hornos there is less exposure during westerly gales to the heavy seas, and the vessel will also avoid the north-easterly current, which is ordinarily met on the way from Cabo San Juan.

On the other hand, the conditions must be suitable. A vessel should not attempt the strait except during daylight (for it is unlighted), and with a fair wind and tide; the best time for beginning the passage through being at one hour after high water. A vessel should, if necessary, heave-to off the entrance of the strait until that moment. Under these conditions, even should the wind fail, or come adverse, a vessel would probably drive through rapidly, for the tidal streams are strong. With a fair wind, force 6, the passage of the strait has been made in two hours. With a southerly wind, however, it would not be advisable to attempt the strait, for, with a weather tide, the sea is very turbulent, and might severely injure and endanger the safety of a small vessel, and do much damage to a large one. In calm weather it would be still more imprudent, unless the western side of the strait can be reached, where a vessel might anchor, on account of the tidal streams which set over to the Isla de los Estados side, where, if it became requisite to anchor, it would necessarily be in very deep water, and close to the land.

Should the northerly wind fail, and the tidal stream not be sufficiently strong to carry a vessel through, there is a convenient anchorage in Good Success Bay (*see* S. America Pilot, Part II).

Note.—Northerly and north-easterly winds are often accompanied by thick, misty weather; vessels approaching the strait are thus often compelled to lie-to for a time.

CAUTION. If the route eastward of Isla de los Estados (Staten island) be taken, there is, off Cabo San Juan, the eastern point of the island, a heavy tide-rip which extends for a distance of 5 or 6 miles, or even more, to seaward. When the wind is strong and opposed to the tidal stream, the overfalls are overwhelming, and very dangerous, even to a large and well-found vessel. Seamen must use every precaution to avoid this perilous area.

(*c*) *Rounding Cabo de Hornos* (*Cape Horn*).—*June and July* are the best months for making a passage to the westward around Cabo de Hornos, as the wind is then often in the eastern quarter. The days are short, however, and the weather cold.

August and September are bad months, heavy gales with snow and ice occurring at about the time of the Equinox.

From October to March, the summer months, the winds are almost invariably westerly.

In April and May, the winds are slightly more favourable.

The passage from East to West around Cabo de Hornos should usually be made in about lat. 57° S., or at about 100 miles southward of the cape, but if, after passing Isla de los Estados, the wind be westerly, the vessel should be kept upon the starboard tack, unless it veers to the southward of S.S.W., until in latitude 60° S., and then on the tack upon which most westing may be made. On this parallel the wind is thought by some persons to prevail more from the eastward than any other quarter.

It would usually be necessary to stand southward in this manner from August to March; but from April fair passages have been made by keeping nearer the land and sighting Islas Diego Ramirez. There is no advantage to be gained by attempting, even with a fair wind, to go close to Cabo de Hornos; for the eastward-going Southern Ocean current sets close past the cape, and appears to flow with greater velocity under the land than farther seaward on the route from Cabo San Juan.

31. Passage from the Pacific ocean to the Atlantic ocean (*Sailing-ships*).

Rounding Cabo de Hornos.—Rounding the Horn from West to East is a comparatively easy matter, for the prevailing winds are favourable and the current sets strongly to the eastward as Cabo de Hornos itself is approached. The passage is usually made between lats. 56° and 57° S. to the northward of the route from the Atlantic ocean to the Pacific ocean. Cabo de Hornos should be passed fairly closely during the summer months (December to February), but at about 80 miles distant in the winter months; the current does not run strongly at 50 miles southward from Cabo de Hornos. December and January are the most favourable months; June and July, when easterly winds are not unusual, are the least favourable. August and September are months in which heavy westerly gales may be expected, with snow and hail.

From Cabo de Hornos onward into the Atlantic ocean.—See Routes 1,083 to 1,087 inclusive.

Making the land after rounding Cabo de Hornos.—The best way is to make the land westward of Cabo San Diego, in Tierra del Fuego, where the shore is free from outlying dangers. While a southwest gale is blowing the vessel can "lie-to" under easy sail in smooth water, and when the wind shifts to the north-west a good run may be made before the wind is again to the southwest. In the Estrecho de le Maire it is better to keep mid-channel, the overfalls off Cabo San Diego being very heavy at times. A vessel drifting from Cabo de Hornos towards Isla de los Estados (Staten island) in a southwest gale should run boldly through Estrecho de le Maire, haul up under the land of Tierra del Fuego, and wait for a shift of wind.

Anchorage.—Temporary anchorage is available in Bahia Buen Suceso (Good Success bay), about 9 miles southward of Cabo San Diego.

NORTH ATLANTIC LANE ROUTES. *See* under Canada, Navigational Notes, Nos. 6, 7 and 8.

SOUTH AMERICA EAST COAST OF

32. St. Paul rocks and Ilha de Fernando de Noronha.—Approaching and passing the above rocks and island caution is necessary as the equatorial current sets to the W.N.W. past them, at from 1 to 2 knots.

33. Passages along the east coast.—Currents.

(1) Passages between the various ports on the east coast of South America, from Recife (Pernambuco) to Cabo de Hornos (Cape Horn) are really coasting passages and directions for them will be found in South America Pilot, Parts I. and II. (*See* also the appropriate parts of Routes 113, 123, and 267, and Caution regarding Ice under Hornos, Cabo de (Note and Caution 29).

(2) Generally speaking all routes are as direct as prudent navigation will allow, but off-lying shoals make wide divergences from the coast necessary in many places, notably in the vicinity of Arquipélago dos Abrolhos (*Lat. 18° S.*), Cabo San Tome (*Lat. 22° S.*), and Albardão lighthouse (*Lat. 33° 12′ S., Long. 52° 42′ W.*).

(3) In making passages the seasonal changes in the coastal currents should be noted. Information concerning the currents is given in detail in South America Pilot, Part I. Summarising this information in very general terms it may be said that the movement of water is towards Rio de la Plata; southwards from Recife; and northwards from Cabo de Hornos, though the latter set is well away from the coast. Off the coast of Patagonia currents are very variable, and within about 20 miles of the coast tidal influences only are felt.

The important seasonal changes are:

(*a*) The position, in the vicinity of Recife, at which the southwards going current starts, varies from about lat. 8° S. in December to about lat. 14° S. in June.

(*b*) *The establishment of the "Brazil Inshore counter-current" from May to July.* Throughout the whole region of the Brazil (southwards going) current there is always a considerable variation, but during the months of May, June and July, the proportion of northward going sets, near the coast between Cabo Frio (*Lat. 23° S., Long. 42° W.*), and Rio de la Plata, increase and, in the vicinity of Rio de Janeiro, slightly predominate the southward going sets. Advantage of this may be taken by making northward passages between Rio de La Plata and Cabo Frio closer inshore during these (southern) winter months than at other times of the year. A frequent set on-shore during this period, however, must be guarded against.

34. SOUTHERN OCEAN.—Sailing-ship passages round the world.—These passages are usually made from west to east with the prevailing wind and current. *See* the following routes.—

Route 1,087.—Cabo de Hornos to Cape of Good Hope.

Routes 1,091 *and* 1,251.—Cape Town to Australia and New Zealand and South Africa to Cabo de Hornos.

The passage from east to west is described in the Routes 1,046, 1,235 and 1,409.

SPAIN (W. COAST) AND PORTUGAL.

35. Passage northward along the coast.—It is usual for northward bound steamers to follow the Portuguese coast and Spanish coast to Cabo Finisterre more closely than the southward bound traffic, and to pass Ushant also between 10 and 20 miles distant, according to weather conditions and current.

36. Navigational Notes.—The coast between Cabo Ortegal and Cabo Finisterre is dangerous to approach at night, especially in winter, or in thick and foggy weather, which is frequent there; for, not only does a strong current at times set eastward towards the land, but the tidal streams also affect the position. In winter, the high land is often obscured, but the beaches at the foot of the hills, and off-lying islets and rocks may sometimes then be seen. Unless absolutely certain of the position, a very wide berth should be given to this coast at night or in thick weather. Many of the lights, besides being weak, are placed so high as frequently to be obscured by mist; and thus give no warning.

There is a most valuable bank of soundings fronting the whole coast, on which depths decrease so gradually as the land is approached, that the distance from it can be told with considerable accuracy by sounding. The depths on the bank, however, are such that unless soundings are taken continuously, and a depth of at least 70 fathoms ($128^{m}0$) reached at each cast, brief warning may be given. The 100-fathom ($182^{m}9$) line passes 11 miles from Cabo Ortegal and 10 miles from Cabo Finisterre.

The channel between Ilha Berlenga and Cabo Carvoeiro is clear and deep; both the Os Farilhões and the Ilha Berlenga may be seen from a distance of 24 miles, and the Peninsula de Peniche at nearly the same distance; all are easily distinguished. This channel, therefore, may be taken without fear at any time when the above points are visible; otherwise vessels should pass outside both Os Farilhões and Ilha Berlenga, giving them a wide berth.

CAUTION is necessary in navigating on this part of the coast in thick weather, in order to avoid running on these isles, as they lie so far from the land and the depths around would hardly give warning in time to clear them.

In thick weather Peninsula de Peniche appears like an island, and has been mistaken for Ilha Berlenga. If Ilha Berlenga is seen, probably also As Estelas, and Os Farilhões will be visible; the breadth of the passage between Ilha Berlenga and the peninsula is much greater than the apparent opening eastward of the peninsula. Carvoeiro lighthouse is on the extremity of the cape, and its base about 90 feet above the sea, while the base of Ilha Berlenga lighthouse is about 300 feet ($91^{m}4$) above the sea.

Current.—*See* under Bay of Biscay, Note and Caution No. 1.

37. Fisheries.—*Trawlers.—Tunny Fishing.*

Trawlers.—Trawlers are found, at times, on the Route from the Channel to Lisbon on the following grounds:—

W. by S. from the south-west point of Belle Isle, working in a N.N.E. and S.S.W. direction; also at about 15 miles N.N.E. of Punta de la Estaca, working in an E.S.E. and W.N.W. direction; also from 6 to 8 miles off shore, between Rio de Arosa and Rio de Pontevedra; and, further south, at about 15 miles W. by N. from the mouth of the Rio Douro, working in a northerly and southerly direction.

Tunny Fishing.—During certain seasons of the year, fishing nets, of large size and great strength, are moored in various localities, for the purpose of catching tunny; they are sometimes more than 2 miles from the shore. During the summer season, between Baia de Lagos and the Rio Guadiana, these nets extend in places off-shore as much as 4 miles and more.

Tunny nets are continuous from their most seaward positions to the shore; vessels cannot navigate inside them and they should, therefore, be carefully avoided. The fishing season varies somewhat in different parts. On the coast of Spain, Africa, and the Islas Baleares, under Spanish jurisdiction, the season extends from 1st February to 30th October.

At the tunny fisheries established off the coasts of Spain and Africa, each tunny net, when submerged, will be distinguished by flags or lights, details of which will be found in the Pilot of the coast concerned.

Nos. 38 to 50.—*Reserved as spare.*

PART II

INDIAN OCEAN, PERSIAN GULF AND EASTERN ARCHIPELAGO

Index

For Notes on Winds and Weather, Currents and Ice *see* Section A and Chapter I. of Part III. of Section B.

The appropriate volume of the Admiralty Sailing Directions should always be consulted for local and more detailed information regarding the above; and also before approaching any coast, island or port.

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NOTES AND CAUTIONS

ADEN, GULF OF ADEN AND APPROACHES.

51. Aden approaches.—*Current.*—At all times of the year, when making Aden, a strong on-shore set of current is frequently experienced.

52. Arabian coast.—*Haze.*—During the South-West Monsoon the weather is generally very hazy along the Arabian coast so that, though the sky may be clear, the land may not be visible until close inshore.

53. Arabian sea. — *Tropical storms.* — Tropical storms, known as "cyclones," occur in the Arabian sea, being most frequent at the seasons of the change of monsoon. Details of these storms will be found in Chapter I. of the West Coast of India Pilot.

54. Capo Guardafui and Socotra.—*General Directions.*

(*a*) *Passage north or south of Socotra.*—It is always dangerous to pass near, or to weather Socotra, in the South-West Monsoon, as the land is often shrouded in mist, and the depths are so considerable that sounding gives no warning of proximity to the dangers which extend some distance from the shore. Moreover, there is little to be gained, in point of time, by passing close to the island, as vessels passing 40 miles northward of it only add 8 miles to the distance from Colombo to Aden. No vessel should, therefore, attempt to make the island, or pass it within 40 miles, when bound westward; more especially in the South-West Monsoon.

During the South-West Monsoon, better conditions of wind and sea are undoubtedly found in the route southward of Socotra, with consequent large saving of fuel and wear and tear. A heavy cross sea will be found, however, southward of Socotra during the South-West Monsoon.

As regards visibility, there is little to choose between the landfall of Socotra and of Ras Scenaghef. After passing the latter point, it will be found that between it and Capo Guardafui the air is not so heavily charged with moisture, and the land can be seen at a greater distance. The sea also becomes considerably smoother, and a strong favourable current will be experienced. If the visibility is bad on making Ras Scenaghef, there is a well-defined bank of soundings extending for 30 to 40 miles from the land in the vicinity; and it will be found an invaluable safeguard.

Though the passage off Capo Guardafui is 40 miles in width, should any doubt exist as to a ship's position, she should take the route northward of Socotra, where there is at least, sea-room, if stormy.

The alternative route, northward of Socotra, is preferred by some navigators, however, on account of the unpredictable variabilities in the currents to the southward, and of the rocky dangers in the vicinity of the passage. There is also the uncertainty of the sea horizon (during the S.W. Monsoon), and consequent difficulty of getting accurate sights when nearing the land.

If the track north of Socotra be adopted, no attempt should be made, night or day, to sight the island in the neighbourhood of Ras Radressa, because it is in the track of the strongest part of the South-West Monsoon, and the currents are strong and irregular; the haze, also, is very deceptive, and there is no bank of soundings by which a vessel's position can be located with any certainty.

The southern route should be taken only by navigators accustomed frequently to fix a ship's position by sights; and also, when necessary, to "feel the way" by continuous and methodical sounding.

When Wireless Direction-Finding Stations have been re-established in the vicinity, the southern route should be preferred by all vessels able to employ this means of fixing position.

(*b*) *Rounding Capo Guardafui.*—Many wrecks have occurred on the coast southward of Capo Guardafui; the utmost caution is necessary when rounding this headland from the southward, or south-eastward during the South-West Monsoon, when the weather is stormy, with a heavy sea, and strong current, and the land generally obscured by thick haze.

The similarity of outline in the headlands of Ras Scenaghef (Jard Hafun or Shenarif) and Capo Guardafui is a fertile source of danger Ras Scenaghef is, however, 2,900 feet high, and much the higher of the two, Capo Guardafui being only about 780 feet high, and separated from Ras Scenaghef by a broad sandy plain of little height compared with the two headlands that bound it.

In hazy weather at night, the steep fall of Ras Scenaghef may dimly be seen from the deck of a vessel; when this bears less than 270°, if Capo Guardafui is not sighted, as is often the case from the haze being thickest in the low strata, and also from the light colour of the hill making it difficult to discern, the navigator, mistaking Ras Scenaghef for Capo Guardafui, fancies he is rounding the latter, steers westward into the low bay of Wadi Tòhen (Tuhom), and discovers his error too late for remedy During daytime, a gradual change from blue to dark green will probably be observed in the colour of the water; it also becomes smoother, and the swell alters its direction to eastward of south when the meridian of Ras Hafun has been passed To ensure safety, however, when the land cannot clearly be seen, sounding should not be neglected.

AUSTRALIA—SOUTH AND WEST COAST.

55. Adelaide and Melbourne, Between.—*Current* —With southerly or westerly winds a current setting on to the land at a rate of one knot is sometimes experienced between Cape Willoughby and Cape Otway To the southward of Cape Jaffa, a current sets to the eastward at about one knot during westerly gales; and at the same time, near Cape Jaffa the current runs to the northward.

Between Rivoli bay and Cape Northumberland, do not shoal the water to less than 25 fathoms ($45^{m}7$) at night; this depth is found, on the average, at rather more than 5 miles off shore

56. *Sailing-ships —Passage westward to Adelaide —See* Route 1,234.

Bass and Banks straits.—*Sailing-ship passages through.*

57. *From west to east.*

(*i*) *North of King island* (*recommended*) —In approaching Bass strait to make the land at Moonlight head or the light at Cape Otway, the currents must be carefully attended to, particularly during south-westerly or southerly winds; vessels have been wrecked on King island by not steering for Cape Otway When approaching Bass strait in thick weather, or when uncertain of the vessel's position, do not reduce the soundings to less than 40 fathoms ($74^{m}2$). Soundings of 60 to 70 fathoms ($109^{m}7$ or $128^{m}0$) will be found at 25 or 30 miles westward of King island. Outside this limit the soundings deepen rapidly to over 100 fathoms ($182^{m}9$).

The high bold promontory of Cape Otway is easily distinguished by the white lighthouse on it, and by the signal station, to which all passing vessels are recommended to show their number. It is desirable to round Cape Otway at a distance of not less than 3 or 4 miles. Thence continue as in Route 1,091 (5) (b).

CAUTION. In approaching King island from the westward, especially during thick and hazy weather, caution is required on account of the variable strength of the current, which sets to the south-east with a force varying from a half to 2½ knots, according to the strength and duration of the westerly winds, and sounding is recommended.

(*ii*) *South of King island* (*not recommended*).—The entrance to Bass strait between King island and the Hunter group is not recommended, on account of Bell reef and Reid rocks which lie in it. If, from necessity or choice, entering Bass strait by this passage, keep to the southward of Reid rocks and Bell reef, the latter being passed at the distance of 2½ miles to the southward of it by steering for Black Pyramid on a bearing of 098°. With a commanding breeze the passage between King island and Reid rocks may be taken without danger by paying attention to the tidal streams, which set somewhat across the channel at times. From Black Pyramid pass about one mile north of Albatross islet, whence to Port Dalrymple, round the sunken danger Mermaid rock, off Three Hummock island, and then make a direct course.

58. *From east to west.—*(*i*) *Via Bass strait.*—From about 15 miles eastward of Cape Howe, if the wind is southerly, do not steer a more westerly course than 212° until in lat. 39° 30′ S. on account of the danger to be apprehended from south-easterly or southerly gales upon the Ninety mile beach between Cape Howe and Corner inlet. On reaching the parallel of 39° 30′ S., steer to pass about 3 miles northward of Wright rock, and the same distance southward of the south point of Deal island, the south-easternmost of the Kent group. Having passed the Kent group, steer to pass 2 or 3 miles south of the Sugarloaf rock, leaving the Judgment rocks on the starboard hand.

From the Sugarloaf steer 15 or 20 miles to the northward of King island, if the wind permits; but should the wind hang to the westward of North, a course may be safely directed for the north extreme of Three Hummock island, taking care to avoid the Mermaid and the Taniwha rocks, passing afterwards north or south of King island, as may be most favourable; the former is preferable.

Navigational Notes.—Local experience has shown that with westerly and south-westerly winds smoother water is found near the coast between Shallow inlet and Conran point, known as the Ninety mile beach; and as south-westerly winds are the prevailing ones, mariners bound westward may often take advantage of the smoother water and an absence of danger to approach the beach, instead of avoiding it. A vessel in-shore when an easterly gale is threatened should at once get an offing; these gales give signs of warning.

Between December and March, as westerly gales veer to the southward, it is advisable to stand toward the Tasmanian coast, and so be ready to take advantage of the shift of wind.

Between April and November, and more particularly in September, October and November, the same course cannot be recommended; then the wind does not shift for a continuance, but is constantly shifting to the west-north-westward.

From east to west.—(*ii*) *Via Banks strait.*

(*i*) *General remarks.*—Banks strait lies between Flinders islands and the north coast of Tasmania, and offers an alternative entrance to Bass strait. The chief dangers to be avoided on the southern shore are the reef and rocks off Swan islands, and the foul ground and rocks northward of Foster islets. It may, however, be noticed that a vessel from the south-eastward can close the shore when Mount Pearson is over Cape Naturaliste bearing 177°, as she will then be westward of Mussel rock, Black reef, and the rocks that lie off the coast.

(*ii*) *Working through to the westward.*—In the summer months when westerly gales are of short duration it is advisable to stand towards the Tasmanian coast, to take advantage of the shift of wind.

There is a good navigable channel between Swan isle and the coast, but in consequence of the strength of the tidal streams it is well to give a wide berth to the foul ground extending from Swan islands and Foster islets. The leading mark for mid-channel is Mount William in line with rocky part of coast north of Mussel Roe bay bearing 151°.

59. Fremantle approaches.—CAUTION. *Approaching the coast northward of Cape Leeuwin.*—Between Cape Naturaliste and Rottnest island, by night, or in thick weather, a vessel should not stand into less than 30 fathoms (54^{m}9) until northward of Naturaliste reefs. Thence northward, she may stand into 20 fathoms (36^{m}6) coarse brown sand mixed with shells, and occasionally gravel and small stones. The depth of 20 fathoms (36^{m}6) however, will be found within half a mile of the dangers off Cape Vlaming, Rottnest island; vessels, therefore, bound to the northward of Rottnest island should not go into less than 30 fathoms (54^{m}9) as the island is approached.

Cape Leeuwin.—Rounding

60. *General directions.*—The distance to which sunken dangers extend off a long stretch of coast about Cape Leeuwin, and the frequent thick weather that prevails with strong on-shore winds and an inset in the same direction, makes it very desirable to give a good berth to this dangerous point in all but settled weather. From 15 to 20 miles is a good margin to leave; and if a spot between these distances to the south-west of the cape is taken as a point for which to steer when coming from the north-westward, namely, just within the range of Cape Leeuwin light, very little time will be lost in making King George sound. When approaching the coast between Cape Naturaliste and Cape Leeuwin by day, in clear weather, vessels may stand into 30 fathoms (54^{m}9), the bottom being coarse sand mixed with shells and small stones. *See* Australia Pilot, Vols. I. and V.

At night.—The greatest caution should be used in running in to make Cape Leeuwin light, with the weather at all thick. The light, powerful as it is, will often not be visible as far as Geographe reef, eight miles to the north-westward; and as mist may hang about the land when it is clear at sea, sounding should never be neglected, and vessels should not stand into less depths than 70 fathoms (128^{m}0).

61.—*Sailing-ships bound westward.*—A vessel from Bass strait bound round Cape Leeuwin is recommended with a favourable wind, to shape a course which will lead about 150 miles south of that cape. In adopting this route advantage must be taken of every favourable change of wind, in order to make westing; and it is advisable not to approach too near the land, as it would become with south-west gales, which are often experienced, even from December to March, a most dangerous lee shore, and the contrary currents run strongest near the land.

62. *Sailing-ships bound eastward.*—As the main route for these vessels passes far to the southward of Cape Leeuwin (*at least* 300 *miles*) no question of directions for rounding the cape arises. *See* Route 1,091.

63. Tasmania.—*Sailing-ship passage down the west coast.*—It is often necessary, and in heavy westerly weather desirable, to make this passage at a considerable distance from the coast of Tasmania;

namely at from 120 to 250 miles from the west coast and around the southern end of the island, often at the same distance.

BAY OF BENGAL

64. Sailing-ship routes.—There is no difficulty in proceeding from southern to northern ports in the Bay of Bengal during the South-West Monsoon, nor from northern to southern ports during the North-East Monsoon. Vessels bound from a port on the eastern side to a port on the western easily make the passage during the North-East Monsoon; so also do vessels from a western to an eastern port during the South-West Monsoon.

When the monsoon is contrary, a sailing vessel must work up or down, as the case may be; or after standing some distance across the bay shape course direct. At the change of the monsoon, voyages are usually tedious, for the light and variable winds, then prevalent, are as often adverse as favourable every slant should be taken advantage of, and the north-eastern part of the bay avoided, unless bound to, or from, one of the ports on that side of the bay.

General directions for vessels bound northward.

(*i*) *January 15th to May 31st.*—Take the western side.

(*ii*) *June, July and August.*—Keep in the middle of the bay.

(*iii*) *September, October and November.*—Take the eastern side.

(*iv*) *December 1st to January 14th.*—Keep the middle of the bay, and make short tacks.

General directions for vessels bound southward.

January 15th to May 31st.—Take the eastern side of the Bay.

June, July and August.—Keep in the middle of the Bay; or take the eastern side and pass eastward of the Andaman islands.

September, October and November.—Take the western side of the Bay.

December to January 15th.—Keep in the middle of the Bay.

65. Cyclones in the Bay of Bengal

General directions for avoiding.—When leaving the Hooghly from June to September notice of the approach of a cyclonic storm, or of the existence of a storm in the northern part of the bay, is given by easterly winds and a falling barometer, or by the storm signals at several prominent positions (*See* Bay of Bengal Pilot). In July or August the storm will probably be of moderate force, although not invariably so, but in June and September some most violent cyclones have visited the coasts of Bengal and Orissa. As a vessel standing southward would most likely run into the storm, the river should not be left until the weather has moderated.

In May, October, or November a squally easterly or north-easterly wind driving low, long-drawn masses of cloud before it, or a strong westerly current at the head of the Bay of Bengal, indicate that a cyclonic storm is in the northern part of the bay, and a vessel should not proceed southward until finer weather prevails. But in these months a cyclonic storm may be far down the bay, and at the Hooghly river, or other port at the head of the bay, there may be every appearance of fine weather. With these conditions, on the first indications of the coming storm the changes of the wind and barometer should be carefully watched, and the course of the storm, if possible determined.

If in the right-hand semicircle the vessel should be hove-to on the starboard tack until the storm has passed, and if undoubtedly in the left-hand semicircle should heave-to on the port tack if the wind is eastward of North, or run southward, keeping the wind on the starboard quarter, when the wind is North, or westward of North.

Vessels lying in the roadsteads of the Coromandel coast on the approach of a cyclonic storm usually run southward round the south-western quadrant, and this is probably the only course open to sailing vessels.

When running up the Bay of Bengal with a strong south-west wind, occasional squalls and rain, and a slowly-falling barometer, bad weather prevails somewhere to the northward.

Between the beginning of June and the middle of September the storm centre is probably northward of lat. 16° N., and in July or August still further northward, and a sailing vessel should steer eastward and take advantage of the southerly and south-easterly winds on the eastern side of the storm as it moves north-westward. But should the weather get rapidly bad, and the barometer continue to fall, then heave-to, and determine the position with regard to the movement of the storm before proceeding.

In May, October, or November the storm travels in some direction from west, through north, to north-east; and its course should be definitely ascertained before any attempt is made to round its eastern side, as if it is moving north-eastward such a proceeding would be attended with danger.

Vessels leaving Rangoon or Moulmein, and encountering strong north-easterly winds, with a falling barometer, denoting the existence of a cyclonic storm eastward of the Andaman islands, should delay their departure until the storm has passed. This is indicated by a rising barometer, and the wind shifting to east or southward of east.

66. BENGAL AND MALACCA PASSAGES.—Bengal passage, formed between the islands of Breueh (Broeh) and Wé, about 11 miles wide and very deep, is the best approach for vessels to Malacca strait from the westward. South-west or north-east winds, according to time of year, always prevail and are fairly steady.

Vessels should approach the passage from northward of North-west islet, to avoid the dangers between it and Breueh (Broeh); thence as requisite for Oelee Lheue (Olehleh), or along the north coast of Sumatra, through Malacca passage.

There is generally a north-westerly current of from one knot to 2 knots through the fairway of Bengal passage; and it is advisable for *low-powered steamers* to keep near the western shore, where the streams are tidal, and where anchorage may be taken if necessary until the flood, or south-east-going stream makes.

It is the best passage at all times when proceeding westward.

CAPE OF GOOD HOPE AND APPROACHES IN THE INDIAN OCEAN.

67. Cape of Good Hope to Durban.—*Steamship passage.*—Keep as close to the land as safe navigation permits, in order to be out of the strength of the Agulhas current. A counter-current will sometimes be found extending from one mile to six miles off shore between Cape Agulhas and Kowie river; also, within 3 miles of the coast between Port Shepstone and Cape Natal (Durban bluff), a northerly set is sometimes experienced during westerly winds.

It is important, when proceeding northward, to hug the coast, not only to avoid the adverse current, but also to avoid the heavy seas when southerly and westerly winds prevail. All salient points, however, must be avoided, and watch kept against indraught into bays.

When nearing Cape Natal (*Lat. 29° 53′ S., Long. 31° 04′ E.*), also known as "The Bluff," a strong set-off from the land may be expected, according to the strength of the main southerly set. This is due to the contour of the coast at this point.

68. Durban to Cape of Good Hope.—*Steamship passage* (*and for vessels bound from the Mozambique channel*).—Keep at about 20 to 30 miles from the coast, so as to get full benefit of the Agulhas current, and from abreast Mossel bay shape course to round Cape Agulhas at a safe distance and thence for rounding the Cape of Good Hope.

69. Cape Province and Natal.—Dangerous sea.—In the event of meeting a south-westerly gale on the latter part of the route, a very dangerous sea will be experienced at or outside the edge of the 100-fathom ($182^{m}9$) bank. Considerably less sea is experienced if a vessel can keep near the coast, about 3 miles, or less if possible, offshore; the reduction in the sea more than compensates for the loss of the favourable current when bound southward. At night, however, vessels should keep in depths of more than 40 fathoms ($73^{m}2$).

70.—Sailing-ships rounding the Cape of Good Hope

From east to west.—June, July and August are the worst months, and January and February the best months for sailing vessels proceeding westward round the Cape of Good Hope, and it should be borne in mind that there is much less sea on the Agulhas bank in depths of from 60 to 70 fathoms ($106^{m}7$ to $128^{m}0$), or less, during heavy gales, than there is near its edge and southward of it. If it is found necessary to heave-to, the port tack should be chosen, as, with the exception of south-easterly gales beginning with south-easterly winds, the shift of wind is almost invariably against the hands of a watch, and the vessel will come up to the sea.

From October to April, easterly winds prevail as far southward as the tail of the Agulhas bank, about lat. 37° S., with variable, but chiefly westerly, winds beyond.

CAUTION. Mariners should remember that off all parts of the south coast of Africa, and especially off salient points, sunken wrecks or uncharted dangers may exist close to the shore; and that it is not advisable to approach this surf-beaten shore, even in full-powered steam-vessels, within a distance of 3 or 4 miles; sailing vessels should give Cape Agulhas a berth of 7 or 8 miles.

From west to east.—*See* Note and Caution No. 14.

71. CEYLON.—Currents

Strong and variable currents are experienced around the southern Ceylon coast during both monsoons; and a wide berth should be given it. A south-westerly set has sometimes been experienced, with a rate of 2 knots, towards Komariya ridge, a dangerous off-lying shoal in lat. 7° 02′ N., long. 81° 54′ E.; and this should be guarded against.

The currents in the vicinity of Dondra head are irregular within 2 miles of the coast, and there may be an indraught to the west of the head.

EASTERN ARCHIPELAGO

72. Steamship passages through the archipelago.—A summary of the various passages outlined in the routes in Section B. of this book is given below. Full details and directions for the various straits, etc., will be found in Eastern archipelago Pilot, Vols. I. to IV. inclusive.

Northward bound.

Soenda straat to Singapore or the China sea.—See Notes at the end of Route 310.

Lombok straat to Singapore.—See Route 443 (a).

Wètar straat to Singapore.—See Route 443 (b).

Wètar straat to Macassar strait.—See Route 510.

Passage through the Banda, Ceram and Sulu seas to the China sea.—See Route 511 (a) (i).

Passage via Djailolo passage, Surigao strait and Verde Island passage to the China sea.—See Route 511 (a) (ii).

Southward bound.

Singapore to Soenda straat.—See Route 440 (1).

Singapore to Lombok straat.—See Route 440 (3).

Singapore to Wètar straat.—See Route 441.

Singapore to ports in the Eastern archipelago.—See Route 686.

China sea to the Eastern archipelago.—See Route 699.

China sea via Mindoro strait to Thursday island.—See Route 700.

73. Sailing-ship passages through the archipelago.—*See* Chapter II. of Section C., Part II.

74. EIGHT DEGREE CHANNEL.—Minicoy island.—The passage through the Eight Degree channel should be made nearer to Minicoy (Minikoi) island than to the Maldives.

CAUTION. The practice of steering to pass a few miles northward of Minicoy, especially by night, is a dangerous one, because the island is over 4 miles long in a north and south direction, the light is on the south-west side, and the current at times sets strongly to the southward.

INDIA.—WEST COAST.—

75. Bombay. *See* also Land and Sea breezes, N. and C. 77 (iv).

Haze.—During the North-East Monsoon, there is considerable haze over Bombay in the mornings and evenings, and often throughout the day, obscuring everything from view. It is particularly noticeable during the interval between the land and sea breezes.

South-West Monsoon.—*Approaching Bombay.*—In the height of the South-West Monsoon, June, July and August, when the weather is thick and heavy, and observations very uncertain, vessels should make Bombay on the parallel of Khānderi island, and should sound frequently. *See also* directions for sailing-ships below.

Current.—During the South-West Monsoon a northerly set may be expected in making the land off Khānderi island.

76. Approaching Bombay. — Sailing-ships. — The following directions are given for sailing vessels approaching Bombay, but steamers can adapt the information contained in them to suit their own requirements with constant reference to the chart.

When steering for Bombay harbour, from the middle of May till August, steady gales and clear weather will be experienced at times, until within 70 or 90 miles of the coast, but cloudy weather with rain and squalls may be expected on the bank of soundings, as the land is approached.

If not certain of the latitude it will be prudent to keep between the parallels of latitude 18° 15′ N. and 18° 25′ N., and endeavour to get soundings on Direction bank, after passing over the Fifty fathoms flat.

During the early part and strength of the south-west monsoon, great care must be observed not to get northward of the entrance of the harbour, for then the north-going tidal stream, as well as the heave of the southerly swell, frequently sets vessels along the bank towards the Gulf of Cambay, and late in May, June and July it would be found difficult at times to work round the Prongs reef. Therefore, in these months a vessel should steer direct for Khānderi island (*Lat. 18° 42′ N., Long. 72° 49′ E.*), allowing for a northerly set of the tidal stream—though the prevailing current outside the depth of 30 fathoms ($54^{m}9$) off the harbour, after the burst of the monsoon, is southward—and endeavour should be made to make the island bearing between 090° and 135°, borrowing a little either way, as circumstances require, to carry a fair wind in entering the harbour.

If the wind is inclined to blow in squalls from west to west-north-west, a vessel should not run too close inshore southward of Khānderi island, not even approach that island too near, as there might be difficulty in weathering it with these winds, which are sometimes experienced in June and July, but are more frequent in August.

During the interval between the land and sea breezes in the forenoon, a heavy smoky haze frequently hangs over the land, obscuring everything from view, so that great care should be exercised when approaching the land shortly after daylight in these months. Occasionally this also occurs during the calm hours of the evening.

From the southward a vessel should not proceed into depths of less than 12 or 11 fathoms ($21^{m}9$ or $20^{m}1$) between Port Chaul and Khānderi island, as in this vicinity large fishing stakes extend some distance from the coast. When Khānderi island bears more than 090° a course may be steered for the entrance to Bombay harbour.

From the northward a vessel should not proceed into a depth of less than 12 fathoms ($21^{m}9$), until Prongs lighthouse bears less than 090°, when a course may be steered for the entrance to Bombay harbour.

Turning to windward a vessel should keep Khānderi island bearing less than 166°, until southward of the line joining North Pap and Thal knob beacons, which, when in line, bear 122°, and when Prongs lighthouse is in line with the extreme of Malabar point, bearing about 353°, she can shape course for the anchorage.

77. Land and Sea breezes

(*i*) *General remarks.*—Owing to the mountains along the western coast of India, the strength and duration of the land winds depend much upon the configuration of the land. The North-East Monsoon makes the land breezes on the Malabar coast; and the rush of cold air from the sea to the heated land, during the hot hours of the day, deadens and reverses the monsoon, making the sea breezes.

(*ii*) *Konkan coast.*—Off the Konkan coast, the South-West Monsoon fails after the middle of September, and is followed by light variable breezes, frequent calms, cloudy weather, and occasional showers. This unsettled weather lasts for 6 or 8 weeks, with prevailing winds from the north-west; but occasionally from south-west and south. On the Kanara, Malabar and Travancore coast there are occasional off-shore squalls.

Late in October, or early in November, a breaking-up storm may take place, with a high wind suddenly coming up from the southward, and blowing hard for several hours, accompanied by thunder and lightning. After this, the North-East Monsoon sets in, with fine weather; and land and sea breezes are experienced within 10 or 20 miles of the coast, which continue until March or April.

(*iii*) *Malabar coast.*—The sea breezes of the Malabar coast are fairly established throughout October, while as yet the land winds are only occasional, light and uncertain; the former seldom fail, till they are merged in the South-West Monsoon. Thus the navigator may calculate on sea breezes for eight months of the year, but on regular land winds for only half that period.

When the land and sea breezes are regular, the sea breeze fails in the evening about sunset, and is generally followed by a calm which continues until the land wind comes off; this may be expected to commence at from 2000 to 2200 hours; at first, it comes in fluctuating gentle breezes, but soon becomes steady between north-east and east-south-east, continuing so till 0900 or 1000 hours next morning; it then begins to fail, decreasing to a calm about midday. About this time, or soon after, the sea breeze sets in from west-south-west, west, or north-west, and generally veers to northward in the evening, decreasing in strength.

(*iv*) *Bombay coast.*—In March and April, off the coast of the Bombay presidency, the land breezes are very light and uncertain, seldom coming off till morning, and continuing so short a time that little advantage is gained by them; it is therefore necessary to keep an offing, to be ready for the sea breeze, which may at this time, between Bombay and Cape Comorin, be termed north-west winds; they usually set in about noon at west-north-west, veering gradually to north-west and north-north-west, in the evening, from which direction they continue during the first part of the night, declining afterwards to a calm about midnight, or early in the morning. A faint land breeze sometimes follows; but more frequently light airs from northward or calms may be expected, nearly from midnight until the north-west wind sets in about noon on the following day.

In April the weather is mostly hazy, and at times cloudy over the Ghats in the evenings, with light showers.

In May the prevailing winds along the coast south of Bombay are from north-west and west, but often variable and uncertain, with cloudy threatening weather and light showers at times, accompanied by lightning from south-eastward. A gale from south-westward or southward is liable to occur in this month, and several ships have speedily run along the coast to Bombay; but it is prudent to keep well out from the land, and to be prepared for bad weather, in order to avoid being driven on a lee shore if a storm should set in from westward. When north-west winds prevail, the weather is settled and clear of clouds, though a little hazy; but it is cloudy and threatening when they blow between south-east and south-west. It sometimes happens that heavy clouds collect over the land in the evenings, producing a hard squall with rain about midnight; this has frequently been experienced between Mangalore and Hog island in May and early in June, when these land squalls blow in sudden gusts through the gaps between the mountains.

(*v*) *Advice to sailing-ships.*—These land and sea breezes require attention for sailing-ships to benefit by them to the full extent. During the night, with the land breeze it is prudent to keep well inshore, if the wind admit, without tacking, for there it is strong and steadier than farther out; but in the morning it is advisable to edge more out, to get an offing of 15 or 20 miles, or soundings of 26 or 30 fathoms ($47^{m}5$ or $54^{m}9$), before noon, ready for the sea breeze. In the evening it is desirable to be near the shore, before the land breeze comes off; the coast may be approached to a depth of 10 fathoms ($18^{m}3$) in most places from Bombay to Quilon, and if close in prior to the commencement of the land breeze, short tacks should be made near the shore until it comes off; when calm, its approach is frequently indicated by the noise of the surf on the beach, which is heard at a considerable distance.

During the period of change, before the South-West Monsoon has set in, the small coasting vessels run into the nearest river or place of shelter south of Bombay in the afternoon, but large vessels should have sea-room.

MOZAMBIQUE CHANNEL.—Navigational Notes

78. Sailing-ships southward bound.—Keep well off the land until up to Cabo Delgado, as the wind sometimes hangs to the eastward and even southward of east; from thence, stand down the coast, inside St. Lazarus bank, keeping in the strength of the Mozambique and Agulhas currents and making Cape Agulhas. A vessel will probably have to work to windward in the southern part of the Mozambique channel, the prevailing winds there being southerly.

79. Sailing-ships northward bound.—In this track, vessels will avoid the strongest part of the south-westerly current, and will be nearly sure of a fair wind until about half-way through the Mozambique channel, when adverse winds may be expected; should such occur, it is better to make easting on the port tack rather than westing; thus avoiding the African coast with its prevailing southerly current. The passage on the eastern side of Ile Europa is recommended, but vessels should not approach that island nor Bassas da India at night, the currents in their vicinity being very strong and uncertain.

The winds in the Mozambique channel do not blow with the same regularity that is found further north, and are generally stronger in the middle of the channel. The northerly monsoon commences between mid-September and mid-October, and the change is usually accompanied by squally weather. When near the Madagascar coast, advantage may be taken of the alternating land and sea breezes.

80. PERSIAN GULF

Directions for passages.—From Ras al Hadd into, and up, the Persian gulf, follow the directions given in Chapter I. of the Persian Gulf Pilot under the heading " Passages."

Haze.—In the Persian gulf, during a shamal in summer or while the nashi is blowing in the southern part of the Gulf in winter, the haze may obscure the land so completely that the surf on the beach may be the first intimation of its proximity.

81. SOUTHERN OCEAN.—Sailing-ship passages around the World.—*See* Note and Caution 34.

SUMATRA.—WEST COAST

82. Passages along.—The routes along the west coast of Sumatra may be considered as three in number, but the Outer route only (in the open sea) may be said to be free from danger, as the coast is only partially surveyed. Vessels should keep the sea until abreast the desired port before hauling in.

For a sailing vessel, the voyage in either direction and at all seasons is long and wearisome on account of frequent calms, but it is generally more difficult to work northward than southward, owing to the prevalence of south-easterly currents, which may be looked for even with and after a southerly wind. January and February are the best months for going northward, while in September, October and November vessels will often be compelled to keep far out to sea in order to make even a little northing; working in-shore during these months is almost impracticable.

Outer route.—The route to the westward of all the islands, in the open sea, is the best of the three, more especially for sailing vessels and others not intending to touch at any of the west coast ports. South-west and southerly winds often prevail here, when north-west squalls, variable baffling winds, calms and southerly currents, may be experienced close to the land. A quicker voyage to the northward will thus be made during either monsoon. If touching at any of the ports, they may be steered for when on their parallel.

Middle route.—The middle route is the space between the chain of large islands, in the offing, and those small islands adjacent to, and interspersed along, the coast, and ranges from 10 to 30 miles distance from the coast of Sumatra.

It should not be followed by a sailing vessel when bound to the northward, nor at any time, if it can be avoided without inconvenience. Although it is wide, and may be adopted by night or day in vessels of light draught when the weather is clear and favourable, vessels are more at the mercy of the currents when the winds are light and baffling, and there is no anchorage; in some parts there are dangerous coral shoals, of the approach to which sounding will give no warning.

Inner route.—The inner route is that close along the coast, and between some of the islands and dangers off it. It, like the Middle route, should seldom be chosen by sailing vessels bound to the northward in either monsoon; but as there are, in many places, moderate depths for anchoring, it is preferable in that respect to the Middle route. Vessels visiting many of the ports are obliged to use it, but considerable risk is run when taking this route at night; those using it are generally obliged to anchor at sunset.

Pilots.—Experience has shown that little confidence should be placed in the natives who offer themselves as pilots on the west coast of Sumatra for ports seldom visited. *See* Malacca Strait Pilot.

83 to 100.—*Reserved as spare.*

PART III

PACIFIC OCEAN

Index

For Notes on **Winds and Weather, Currents and Ice** *see* **Section A. and Chapter I. of Section B., Part IV.**

The appropriate volume of the Admiralty Sailing Directions should always be consulted for local and more detailed information regarding the above; and also before approaching any coast, island or port.

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NOTES AND CAUTIONS

ALASKA, ALEUTIAN ISLANDS, BERING SEA. —Fog—Ice.

101. **Fog.**—*Alaska.*—Northward of the 40th parallel from the coast of America to that of Asia, and especially in the vicinity of the Aleutian islands and in Bering sea, fog is liable to occur at any time, but is most frequent in July, August and September.

102. *Aleution islands.*—During the summer months the mist and fog are considered to be worse on the southern side than on the northern side of the islands, when in their immediate vicinity.

103. *Bering sea.*—Fog is most prevalent during spring, summer and early autumn, and it generally begins to clear about the middle of October. Fog is almost continuous in summer, but few days are clear from morning to night and the tops of the mountains can seldom be seen. At the surface of the water it is generally sufficiently clear to make out the shore, at a distance of 3 or 4 miles, but at times it is so thick that nothing can be distinguished, and, under such conditions, strangers should not attempt to make the land.

104. **Ice.**—*Alaska and Aleutian islands.*—Practically the entire southern coast of Alaska, including the Aleutian islands, is free from ice the entire year. Ice forms at the heads of inlets, when the water is comparatively fresh, and in the rivers, but never in the main channels; in these latter, however, floating patches of slush ice, formed in fresh-water streams and lagoons, are sometimes found, but never form an obstruction to navigation.

AUSTRALIA, EAST COAST.—The following directions, notes and cautions already appear in Routes 475, 507, 1,256 and 1,266, and to a lesser degree in other routes; nevertheless, owing to the number of routes which pass along the east coast of Australia, they have been collected and re-printed in Section D. to facilitate easy reference.

Bass strait to Sydney

105. **Steamships.**—*Northward bound.*—From a position east of Cape Howe, steer to the northward along the land to Port Jackson, in fine weather at a distance of about 2 miles, passing inside Montagu island, to avoid southerly set of the current.

Southward bound.—Keep at a distance of about 15 miles off the land, along the 100 fathom ($182^{m}9$) line of soundings, in order to take advantage of the southerly current. Close the land in the vicinity of Cape Howe or Gabo island.

106. **Sailing-ships.**—*Northward bound.*—Steer to the northward along the east coast for Port Jackson at such distance from the land as the wind and weather would suggest, bearing in mind that the current generally sets to the southward at a distance of 20 to 60 miles from the land. Having made the Outer South head light enter the port, noting the directions given in Australia Pilot, Vol. II., and that they are designed for steamships; nevertheless the directions should prove of value even to sailing-ships.

CAUTION. A vessel making the coast in thick weather should not neglect sounding. The 100 fathom ($182^{m}9$) line is well defined and lies 9 to 10 miles or more from the coast, except off Montagu island, from which it is distant only about 5 miles. Unless very sure of her position a vessel should not get into soundings of less than 50 fathoms ($91^{m}4$).

Southward bound.—Keep at a distance of 20 to 60 miles from the coast, so as to derive the full benefit of the southerly current.

Great Barrier reef.—Inner and Outer routes.

107. Steamships bound northward.

General remarks.—Vessels proceeding from Sydney to Torres strait can take one of two routes, known as the Outer and Inner routes. The Outer route, unless for some special reason, is only used by sailing vessels. It is described generally below and in greater detail in Australia Pilot, Vol III; it takes a vessel eastward of the Great Barrier reefs, through the Coral sea, and enters Torres strait by Raine island or the Great North-east channel, or other openings northward of Cape Melville.

(*a*) *Inner route.*—The Inner route is the one usually taken by all steam vessel, ensuring, as it does, smooth water for the greater part of the passage; the numerous beacons placed on the reefs, together with the lighthouses at the most dangerous parts of the route, tend to give comparative safety, and the saving of the distance is considerable.

CAUTION. Implicit reliance should not be placed in beacons marking the inner routes, as they are liable to be washed away.

When northward of Barnard islands, vessels should be kept, as far as possible, on the track laid down on the Admiralty charts.

Passages for vessels proceeding northward, via the Inner route, passing through the Curtis or Capricorn channels, are described in Australia Pilot, Vol. IV. The track down is the same, reversed, for vessels proceeding southward from Torres strait.

Curtis and Capricorn channels are the only entrances into the Inner route from south-eastward. Between Queensland ports and New Guinea, the route through the various passages is, since the recent surveys of these openings and the accurate determination of the positions and extent of most of the outlying reefs between lat. 13½° S. and 18° S., rendered merely a matter of careful navigation, provided the sun is in a favourable position. (*See* "Navigation among coral reefs" and the general remarks in Note and Caution 135.

Most of the openings trend in a north-easterly and south-westerly direction, thus rendering them available for a sailing vessel for either entry or departure with the prevailing South-East Trade wind.

Lark pass (*Lat. 15° 07′ S., Long. 145° 43′ E.*), which is marked by beacons, and is much used when making the passage between Cooktown and New Guinea, is described in Australia Pilot, Volume III.

CAUTION. When navigating the Inner route, if there be any doubt about the position, due to thick weather or darkness, the vessel should be anchored until more favourable conditions prevail. Northward of Cooktown, the South-East Trade wind, which prevails from April to October, causes at times a dense haze, which renders it difficult to pick up islands and landmarks at night.

Any parts of the route not sounded (as shown by absence of soundings on the charts) must be traversed with more than ordinary caution.

Pilots.—Application for a pilot for the Inner route may be made to the Secretary of the Marine board, Brisbane.

Masters of vessels proceeding to Australian East Coast ports, and requiring a Torres straits pilot at Thursday island, are advised to notify the Torres Straits Pilots' Association, Sydney, telegraphic address "Torres—Sydney," from their last port of call, giving the approximate time and date of arrival at Thursday island. This will prevent delay, and enable a pilot to be on the station. Vessels are required to anchor off Tucker buoy for medical inspection.

The pilot cutter dusplays flag K of the International Code of Signals, and is a motor launch, painted white, with two masts.

Curtis channel.—A full description of this channel and directions for its navigation will be found in Australia Pilot, Vol. IV.

Tidal streams.—When passing through Curtis channel, the flood and ebb tidal streams will be found to run about south-south-westward and north-north-eastward, respectively, while about 10 miles nothward of Bustard head, their directions are westward and eastward, respectively.

Capricorn channel.—Capricorn channel is the broadest, shortest and safest entrance into the Inner route from southward. It is entered between the Capricorn group and Swain reefs, about 60 miles north-eastward, and extends about 100 miles in a north-westerly direction, to a position between Cheviot island and Cape Townshend, where it joins Curtis channel.

The channel may be entered anywhere between the parallels of 22° 30′ and 23° 10′ S. and the meridians of 152° and 152° 30′ E. It lies north-eastward of the Curtis channel, between the mainland, and the inner edge of the Great Barrier reefs.

Great caution is necessary if approaching the southern extremity of Swain reefs, as there are depths of from 50 to 60 fathoms ($91^{m}4$ to $109^{m}7$) close to them.

A keen look-out from the masthead, and ready action, is always necessary when navigating amongst reefs or in passing through partially surveyed water; the sun should be in a favourable position for seeing the reefs. (*See* " Navigation among coral reefs," on page 367).

Tidal streams.—The flood tidal stream sets westward, and the ebb tidal stream eastward, at a rate of from one to 2 knots; but, with south-easterly winds, a great degree of north-westerly set may be expected.

In the offing, 20 miles eastward of Hixson cay, the ebb tidal stream sets eastward at a rate of three-quarters of a knot, and the flood tidal stream westward at a rate of 1½ knots; the turn of the stream takes place later than low water, and earlier than high water, on the reef.

A strong westerly set is stated to be experienced, frequently, in the vicinity of the Capricorn group; caution is necessary, therefore, when making North Reef light.

Route from Curtis or Capricorn channels northward.—The passage through the Inner route as far as Cape York and Adolphus channel is described fully in Australia Pilot, Vol. IV; thence to Thursday island and the channels in the Torres strait is described in Australia Pilot, Vol. III.

(*b*) *Outer Route.*

(*i*) *Via Raine Island entrance.*—Steer up the coast from Port Jackson as far as abreast of Cape Byron; and from that point make a direct course so as to pass about 30 miles westward of Wreck reef, and 20 miles eastward of Frederick reef; thence steer to round Lihou reef at about 50 miles distance, and thence to a position in lat. 15° 30′ S., long. 152° 00′ E.

From this point take a direct course for Raine Island entrance (Beacon tower, 64 feet ($19^{m}5$) high, on Raine island). There is a north-going current in this vicinity which should be allowed for.

The directions from Raine Island entrance, by Blackwood channel, to Inner Route and Thursday island are given in Australia Pilot, Vol. III.

(*ii*) *Via Great North-east channel.*—Take the route described in (b) (i) above as far as lat. 15° 30′ S., long. 152° 00′ E., and make a direct track thence to lat. 9° 40′ S., long. 146° 00′ E., and thence to lat. 9° 00′ S., long. 145° 10′ E. At this point, turn sharply to the westward, to enter the Great North-east channel at Blight entrance, passing southward of Bramble cay (beacon visible about 10 miles in clear weather) at a distance of five miles.

For directions thence through the reefs to Torres strait and Thursday island, *see* Australia Pilot, Vol. III. Also *see* Admiralty Charts upon which appears the track recommended.

See Australia Pilot, Vols. III. and IV., for passage to Thursday island (Torres strait) by Inner route.

108. Steamships bound southward.—Follow the directions above in reverse.

Great Barrier reef.—Inner and Outer routes.

109. Sailing-ships bound northward.—It is not desirable to be up with the entrance of Torres strait before the beginning of April, in order to avoid the chance of an equinoctial gale, as well as to make sure of the South-East Monsoon having well set in, in the Arafura sea. Vessels have left Sydney as late as October, and made their passages; yet, generally speaking, it is much too late; for although the North West Monsoon does not blow until November, and sometimes later, the calms and light variable winds that precede it protract the passage very much.

Large sailing vessels now very seldom take the Inner route, but a considerable number of small sailing vessels do so without difficulty.

Note.—Fogs rarely occur off the coast of Australia, except in the summer months, October to April, and then seldom last longer than from dawn to 10 a.m. When the sea breeze is blowing, it is accompanied by a thin haze, which envelopes the land and renders it indistinct; this haze is dispersed by the land wind.

(*a*) *The Outer route.*—The Admiralty charts of the Coral sea afford at a glance the best view of the Outer route, from the parallel of Sandy cape to Torres strait; and if the tracks shown on the charts, which lead through the most frequented part of the Outer route, be followed there will not be much cause for anxiety before reaching the Great North-East channel, which leads from the Outer route inwards through the reefs to Torres strait proper, directions for which are given below.

The other principal entrance to Torres strait from the Coral sea is through Raine Island entrance, but sailing vessels are recommended to use the Great North-east channel . Directions for the approach to, and passage through Raine Island entrance are, however, given in (ii) below.

On leaving Port Jackson, and bound northward, avoid the south-going coast current by keeping within about 2 miles off the land, though the wind may be puffy.

As soon as conditions are favourable, it is recommended to make the most direct course to approach the southern entrance of the Outer route on the parallel of 24° S., and the meridian 157° E.

Having crossed the parallel of 24° S. in long. 157° E., steer about 355°, allowing for current, for 170 miles, when the vessel will have passed 70 miles eastward of Cato bank and Wreck reef, and will be in lat, 21° 10′ S., long. 156° 45′ E., or 50 miles eastward of Kenn reef. Then steer about 323° for 430 miles, to lat. 15° 30′ S., long. 152° 00′ E., passing 50 miles eastward of Lihou reef. From this position proceed as in (i) or (ii) below.

(*i*) *Via Great North-east channel.*—Steer 313°, allowing for current, for a distance of 560 miles, to lat. 9° 00′ S., long. 145° 07′ E. This course will lead about 25 miles north-eastward of the Eastern fields, and 30 miles north-eastward of Portlock reefs. The vessel should carry no more sail at night than she will conveniently bear if suddenly hauled to the wind; and every precaution should be taken against unknown dangers, which in this comparatively little-known region may possibly exist.

From lat. 9° 00′ S., long. 145° 07′ E., steer to a position about 4 miles southward of Bramble cay, and thence follow the recommended track as indicated in pecked line on the chart.

(ii) *Via Raine Island entrance* (*Lat. 11° 35′ S., Long. 144° 02′ E.*).—Although the distance by this route is about 90 miles less than (i) above, entering the Great Barrier reef by Raine Island entrance is necessarily attended with more risk and anxiety, and the saving of distance is insufficient to warrant this course for a sailing-vessel except in special circumstances.

From the position in lat. 15° 30′ S., long. 152° 00′ E., above-mentioned, steer about 298° for a distance of 520 miles to the island, passing 70 miles north-eastward of Diane bank, and 50 miles north-eastward of Osprey reef. The directions for the passage, by steamships, through Raine Island entrance and onward to Torres strait, are given in Australia Pilot, Vols. III. and IV. These directions should be studied by the masters of sailing-ships.

Note.—If through thick weather or other unfavourable circumstances, the vessel is so much out of reckoning as to miss Raine island and Pandora entrance also, the Great North-east channel is the only opening to leeward recommended, although s vessel may pass through Olinda, or Yule entrance, if hard pressed, or even through one of the gaps further north. When running to the northward for the Great North-east channel, steer nearly parallel with the Great Barrier reefs, and at such distance from them as circumstances may render necessary. As this route is little known, much is left to the discretion and vigilance of the navigator, especially when passing between the barrier and the outer chain of reefs, which lies south-eastward of Murray island, and contract the channel to about 20 miles in width. Having reached the parallel of 9° 05′ S., bear up to the westward for Bligh entrance, and proceed generally as directed in Australia Pilot, Vol. III., noting that the directions given therein are intended for steamships.

(*b*) *The Inner route.*—Proceed as directly as possible up the coast to Sandy cape.

The prevailing wind off the coast to Sandy cape being north-easterly from October to April, and westerly from May to September, the seaman will use his own discretion in getting to the northward against the strong southerly current generally running along the coast. The strength of this current is found on the edge of the 100-fathoms ($182^{m}9$) line of soundings, from 10 to 30 miles from the coast, and will be avoided by keeping well outside this line.

Curtis and Capricorn channels are the only entrances into the Inner route from the south-eastward; the latter is recommended. For details of these channels and of the Inner route, *see* Route 507 (a), and Australia Pilot, Vol. IV.

110. **Sailing-ships bound southward.**—This passage appears not to have been made very often, and like that from Torres strait to Sydney by the Inner route, was formerly considered only practicable in the North-West Monsoon—from November to February or March. The first object after clearing Torres strait, in the North-West Monsoon, will be to take advantage of westerly winds for making easting, looking upon immediate progress to the southward as of secondary importance.

Directions.—When starting to the eastward from Prince of Wales channel or Cape York, in the North-West Monsoon, proceed by Raine Island entrance, following inversely the directions given for proceeding to the north-westward; or preferably by the Great North-east channel. And having cleared the Great Barrier reefs or Eastern fields, as the case may be, take every advantage of westerly breezes, and endeavour to reach a position in about lat. 15° S., long. 156° E., going as much as practicable over the frequented route shown on the chart, and keeping an especial look-out when proceeding eastward of the route, into the unexplored space northward of Mellish reef.

Having attained the meridian of 156° E., and thus probably far enough to the eastward to take advantage of the South-East Trade, haul on a wind on the port tack and try to fetch Mellish reef; great caution is necessary when in the neighbourhood of this reef; and there is generally a strong westerly set to guard against. Pass, if the wind permit, between Kenn and Wreck reefs on the east side, and Frederick and Saumarez reefs on the west side.

Should there be too much southing in the prevailing South-East Trade wind to weather Frederick reef, pass to the westward of it, and between Saumarez and Swain reefs, when a southerly current will probably enable a vessel to weather Sandy cape, care being taken to avoid Breaksea spit and the shoal near its eastern edge.

Note.—As a rule a vessel should be so sailed as to close the intermediate passage reefs in the daytime, to take a fresh departure, as the current between Saumarez and Swain reefs may otherwise seriously affect the vessel's reckoning.

From Sandy cape proceed for Sydney by keeping the mainland in sight, to take advantage of the southerly current.

111. **BORNEO—NORTH-WEST COAST.—Sailing-ship passages northward along the coast.**—The directions for the approach to this coast through the channel between Great and South Natuna islands, or through Koti passage, Serasan passage or Api passage are given in Route 1,302 and 1,303. *See also* the Notes on the current in Api passage at the end of Route 1,312; and Notes on the approach to Balabac strait in Route 1,303.

Steamships.—See Note and Caution 122, "The Palawan passage."

BRITISH COLUMBIA

112. Currents and Tidal Streams.—Fogs—Smokes—Kelp.

Currents and Tidal Streams.—*See* British Columbia Pilot, Vols. I. and II., in which considerable information is given regarding the set of the currents and tidal streams on this broken coast with many outlying dangers.

Fogs.—Summer fogs prevail upon the coast from June to September, and in some seasons they are almost continuous, and very dense. They extend along the seaboard from Alaska, and at times reach as far south as Cape San Lucas. They frequent stretch several hundred miles seaward, and appear to be associated with the Kuro shio (Japan) current. At times they appear local, and exist in the vicinity of the great wind-gaps along the coast, whilst the prominent headlands and coast peaks are free.

Juan de Fuca strait.—In Juan de Fuca strait, the fogs are heaviest near the entrance, and decrease in frequency and density up the strait. Sometimes the fog stands before the entrance like a wall, and vessels entering run from it into bright, clear weather, even before they pass Tatoosh island. As a rule, it may be said that the fog is more likely to follow farther into the strait along the southern shore, reaching as far as Port Townsend, when the northern side of this wide part is free.

During the prevalence of these fogs, the wind is moderate or calm, and the weather becomes mild and pleasant, with gentle breezes; or strong north-west winds may come up, and drive away the fog, bringing clear skies, and the regular north-west swell of the Pacific. In winter, the fogs are replaced by the thick murky weather of the south-easters, which bring up rain and squalls, but through which headlands can be made out at a distance of several miles. Fog occurs in winter, but they are exceptional, and do not last long.

Northward of Cape Caution.—Fogs are prevalent, especially during the summer months. The north-west winds, which prevail during that season, condense the vapour which arises from the comparatively warm water surrounding Queen Charlotte islands and the coast of Alaska. During the prevalence of north-west winds this vapour is dispersed, but during calms or with light winds, and especially with south-westerly winds succeeding north-west winds, it approaches quickly from seaward in the form of dense fog, or drizzling mist and rain.

At times fog will be found at the entrances to the sounds during the forenoon, dispersing near noon by the heat of the sun, the afternoons becoming clear and fine.

In the outer part of Queen Charlotte sound it has been observed that the fog sweeping in from seaward often broke up after passing the groups of islands blocking the mouth of the sound, making a line of fog-bank stretching between the Gordon and Millar groups, and leaving the area to the south-east of this line comparatively clear.

Smokes from forest fires cause much inconvenience during the dry season, July, August, and September, and are a great impediment to navigation. In some seasons they have extended from the Strait of Georgia to Portland inlet. In recent years their prevalence has considerably diminished, some seasons being almost entirely clear of them; they are cleared away by rains.

Kelp.—Kelp is visible on the surface of the water during the summer and autumn months, growing on nearly every danger with a bottom of rock or stones, especially in those channels where the water is in constant motion; but during the winter and spring this useful marine plant is not always visible, and in British Columbian waters in close harbours where there is little motion in the water it is often absent.

It should be the invariable rule never to pass over kelp. In general, by keeping clear of kelp danger is avoided, but this must not prevent attention to sounding, as the rule sometimes fails; kelp is always a sign of danger, and unless the spot where it grows has been carefully sounded, it is not safe for a vessel to pass through it. A heavy surge will occasionally tear the kelp away from rocks, and a moderate stream will cause it to submerge. When passing on that side of a patch of kelp from which the stems stream away with the current, care should be taken to give it a wide berth, because the kelp showing under such conditions is on one side of and not over the rocks. The least depth will usually be found in a clear spot in the middle of a thick patch of fixed kelp.

It is perhaps well to point out that kelp, not attached to rocks, floats on the water in heaps, whereas kelp, attached to rock, streams away on the surface and the leaves give an occasional flap.

113. Juan de Fuca strait.—*Current.*—A strong N.W. set is often felt across the entrance to Juan de Fuca strait, and should be carefully guarded against.

Fog.—*See* Note and Caution 112.

Passage to Vancouver.—The best route for deep draught vessels from Juan de Fuca strait to Burrard inlet (Vancouver city) is south of Trial and Discovery islands, through the main channel of Haro strait, and northward of Stuart and Skipjack islands; thence through Boundary pass westward of Patos island, into the Strait of Georgia.

The usual route for moderate-sized vessels to Burrard inlet is south of Trial island, thence by the inshore channels, Mayor and Baynes, passing westward of Chain and Chatham islands; thence to the northward, passing eastward of Zero rock, and between Darcy shoals and Darcy island, through Sidney channel and Moresby passage, thence through Swanson channel, between Pender and Prevost islands, and thence through Active pass into the Strait of Georgia; it is shown by a pecked line on chart 2689. By using this route weaker tidal streams will be experienced than are found in Haro strait route.

114. Inner passages off the coast of British Columbia.—When navigating the inner waters of British Columbia, it should be constantly borne in mind that many of the minor passages have only been roughly examined; detached boulders from the broken shores and pinnacles of rock are still frequently found. Whenever, therefore, a broad and clear channel which has been surveyed is known to exist, there is no justification in using, without necessity, one of more doubtful character, even if there be some saving in distance; and a vessel should always be maintained in the safest possible position in a channel, as well as when going in or out of port. For further information regarding these channels, *see* Route 785; full details are given in British Columbia Pilot, Vols. I. and II.

CABO DE HORNOS (CAPE HORN). *See* Note and Caution 31 on page 347.

CENTRAL AMERICA (W. COAST) AND PANAMA.—Sailing-ships.

115. Passages to Panama.

From the Northward.—Bound to Panama from the northward try and make the Isla Jicarita, which lies about 55 miles westward of Punta Mariato, and from this endeavour to keep under the land as far as Cabo Mala. If unable to do this, stand across for the opposite coast of the continent, when the current will be found favourable. In getting eastward of Cabo Mala the safest plan is to shape a course for Isla Galera, and to use the eastern passage. At the same time, if tempted up the gulf by a fair wind, endeavour to get on the western side of the Archipielago de las Perlas, where anchorage and less current will be found should the wind fail.

From the Southward.—After crossing the equator steer for Isla Galera (*Lat. 8° 30′ N., Long. 79° 00′ W.*), at the same time taking care, especially in the dry season, to stand inshore with the first northerly winds. By so doing, vessels will most probably have the current in their favour along the coast, whereas by keeping in the centre, or on the western side of the gulf, a strong southerly set will be experienced.

After making Galera and clearing the Banco San José, the navigation between the Archipielago de las Perlas and the mainland is clear and easy, with the advantage of being able to anchor, should the wind fall and the tide be against the vessel. As a rule this passage should be taken, but with a strong southerly wind the navigator is tempted to run up the bay, in which case he should keep towards the western side of the Archipielago de las Perlas, where anchorage and less current will be found should the wind fail, an event always to be expected in these regions.

116. Colombia coast and Panama bay.—*Winds and weather, and currents.*

Winds and weather.—Northward of Punta Guascama, the winds become more variable and rains more frequent, and the following account by Dampier is perhaps as good as can be given:—" It is a very wet coast, and rains abundantly all the year. There are but few fair days, for there is little difference in the seasons of the year between the wet and the dry; only in that season which should be dry the rains are less frequent and more moderate than in the wet season, for then it pours as out of a sieve." This kind of weather is found as far as Cabo Corrientes (*Lat. 5° 30′ N., Long. 77° 33′ W.*), the prevailing wind being south-west, but north-east winds are not uncommon. Offshore in this zone, between the parallels of 2° and 5° N., the winds are equally baffling, especially during the months of March, April and May.

Between Cabo Corrientes and Panama, the prevailing winds are from the northward and westward, with frequent squalls and wet weather from the south-west between the months of June and October.

Currents.—Within 60 miles of the coast there is a constant current to the northward. After passing Cabo Mala it meets the Mexican current from the west-north-westward, and thus causes the numerous ripplings and short uneasy sea so often met with at the entrance of the Gulf of California. This troubled water will be found more or less to the southward, according to the strength of the contending streams.

117. Passages from Panama.

(*a*) *Passage out of Panama bay.—General notes.*—Bound in any direction from Panama, the chief difficulty is the passage out of Panama bay, for light and baffling winds or calms are met with there at all seasons.

Between October and April, the prevailing wind in the gulf is from the northward; for the remainder of the year the wind hangs more to the westward, and land and sea breezes are felt, varied by calms and occasional squalls from the south-westward. Northward of lat. 5° N., between the 80th and 100th meridians W., is a region of calms and light winds, varied by squalls of wind and rain; but southward of lat. 5° N., westward of the meridian of 80° W., between the mainland and Archipielago de Colon (Islas Galapagos), the wind is between south and west all the year round and except between the months of February and June, is fairly strong. Whether bound north or south from Panama push to the southward and gain the South-East Trade; by so doing the doldrums and vexatious winds will not only be avoided, but there will be the additional advantage of salubrious weather, with the sea at a temperature of 75° instead of 83° Fahr.

(*b*) *To ports of Central America.*—The passage to ports along the coast of Central America is slow and troublesome to sailing vessels; advantage must be taken of every shift of wind to get to the north-westward. The currents will be with the ship as far as the Golfo de Fonseca, when the Mexican stream will be fairly met, and if bound to Acapulco or Mazatlan, the passage may be better made by standing off from the coast, after reaching Fonseca (*Lat. 12; 54′ N., Long. 87° 42′ W.*).

CAUTION. " *Northers* " *in Gulf of Tehuantepec.*—If one of these gales should be met, and sail can be carried, it is advisable to ease the sheets off and run well to the westward, without seeking to make northing; if obliged to heave-to, from two or four days' heavy weather may be expected, with a high short sea, a clear sky overhead, and a dense red haze near the horizon. It is said that if the summits of the Sierra Chimalapa are hidden about sunset by a slate-coloured vapour, a " Norther " will blow the following day; and if similar mists are seen on the ocean horizon at sunset, a south-south-westerly wind will blow the next day.

(c) *General remarks on passages from Panama to the southward.—See also* (a) above.

These passages are all slow and difficult for a sailing vessel, on account of the contrary coastal current, running to the northward throughout the year and the equally contrary light, but persistently southerly winds.

The general opinion appears to be that, if bound for ports along the coast southward as far as Callao, it is better to beat down the coast; but if bound to ports such as Mollendo, Iquiquie, Antofagasta, etc. it is better to make an offing into the trade winds, reach the coast by the westerlies southward of lat., 30° S., and the run northward with a fair wind and current to the desired destination.

CHINA. Navigation along the coast.

118. Steamships.—For a summary of the passage along this coast *see* Route 691 (a), (b) and (c), and Navigational Notes following (b). Full details regarding navigation will be found in China Sea Pilot, Vol. III.

Southward bound the general direction in Route 691 (taken in reverse) apply as regards the passage along the China coast.

The following two cautions, being useful to vessels making the coast from the eastward are re-printed here.

Cautions.—Care is necessary when navigating on this coast, as the tidal streams are very strong in places, especially in the vicinity of the Lamock islands, Amoy, Ockseu islands, Tung yung, the Tai chow lieh tao (Tai chau islands), the Chusan archipelago and the Yangtze kiang approach. At all times during the north-east monsoon the weather is uncertain, and strong breezes set in without any warning, sometimes lasting two or three days or even more. Fog is experienced in the early part of the year.

Several vessels have stranded on outlying islands on the coast of China between Fokai point and the entrance to the Yangtze kiang, and generally the stranding would not have occurred if the vessel had been kept in a proper depth of water; attention is therefore called to the necessity of constantly sounding in thick or misty weather. Many lighthouses of the islands are at a considerable height above the sea, and often the upper parts of the islands and the lights are obscured by fog; so, as a general rule, if a light is not seen when a vessel is within its distance of visibility, sound at once, even if the weather is apparently quite clear, and proceed out to a safe depth, continuing sounding until the position is ascertained.

119. Sailing-ships.—Directions for the passage along the China coast are given in the following routes.—

Northward bound.—Route 1,320.

Southward bound.—Route 1,325.

China Sea.

Principal routes through the China sea.

General remarks.—Towards the centre of the southern portion of the China sea, there is a considerable area of unsurveyed and dangerous ground, known to be encumbered with coral reefs and banks, which should be avoided. This area is described in China Sea Pilot, Vol. II., within the limits of the pecked line enclosing the " Dangerous ground." Vessels are recommended to follow the routes shown on the charts of the China sea, as far as practicable.

There are three principal routes, known respectively as the *Main route*, the *Eastern route* and the *Palawan passage.*

120. The Main route (both monsoons).—Mail and other full-powered steam vessels take the Main route; that is between Pulau Aur and Anamba islands, eastward of Pulau Sapatu, and thence between Macclesfield bank and the Paracel group to Hong Kong, and other ports to northward.

121. The Eastern route (North-East Monsoon—Alternative route).—The route taken by many full-powered steamers in the North-East Monsoon, and recommended for vessels of moderate power, is, after passing westward of the Anamba islands, to steer about 30 miles westward of the Prince of Wales bank and North Danger reef, and thence about the same distance eastward of Macclesfield bank. The current is decidedly favourable in this track, from about lat. 10° N., except possibly when the monsoon is unusually strong.

122. The Palawan passage (Low-powered vessels).

CAUTION.—Mariners are warned that a strong N.W. set is experienced in the southern part of the Palawan passage westward and north-westward of Balabac and North Balabac strait during the height of the N.E. Monsoon. *See* General remarks on currents in China Sea Pilot, Vol. II.

After leaving Singapore, steer to pass about 5 miles northward of the light on Subi kechil, carefully allowing for the current; then steer to make good a 077° course for a distance of about 230 miles, whence the course is clear up to the entrance of the Palawan passage, passing between the South Luconia shoals and Tanjong Baram, and keeping as close as circumstances may make convenient to the Borneo coast, until abreast of that point. Thence a course should be shaped to keep seaward of the 100 fathoms (182^{m}9) edge of the bank fronting Palawan, to Balabac island; thence midway between the Royal Captain shoal and the edge of the bank; this portion, about 28 miles in width, is the narrowest and most dangerous part of the channel.

An alternative route is as follows:—On leaving Singapore, pass southward of Kayu Ara, the southernmost of the Pengibu islands, then steer to sight the light on St. Petrus, carefully allowing for the current, and afterwards steer for Api passage, keeping towards Merundung rather than Tanjong Api. Having passed Merundung and Tanjong Datu, proceed as above.

If the wind be well to the southward, and the weather clear, Balabac island may be approached sufficiently near, in order to obtain a good observation of the land, but caution is necessary not to go within 12 miles of it, as soundings of 26 and 20 fathoms (47^{m}6 to 36^{m}6) extend to that distance off, in a westerly direction from the peak, having shoal patches immediately inside them.

If the wind be to the westward, with thick cloudy weather, Balabac island should not be approached nearer than 30 miles, as westerly winds usually force a strong easterly current through the passages. Off the south-west end of Palawan, it is not unusual, particularly in squalls, for the wind to veer to W.N.W., and sometimes N.W., blowing with violence and placing the vessel on a lee shore with respect to the shoals inside the edge of the bank. This weather generally prevails off the south-west end of Palawan, about September and October, rendering it uncertain and difficult to make the narrowest part of the channel, owing to the land being obscured, especially if the position of the vessel has not been checked by observations. Under these circumstances, it is advisable to proceed with caution, regulating the speed of the vessel so as to pass The Royal Captain shoal during daylight.

If uncertain of the vessel's position, endeavour to get soundings on the edge of the bank north-westward of Balabac island, the safest part to approach for this purpose being about the elbow, on the parallel of 8° 30′ N., or immediately to the southward of it; for it is believed that the edge of the portion of the bank with Balabac peak bearing from 120° to 160°, comprising a distance of 25 miles, is free from danger. If the peak be obscured the same bearings of the body of the island will answer.

Experience shows, however, that in the thickest weather the land is seldom totally obscured for any length of time, but generally presents a well-defined outline between the squalls.

Having obtained soundings (which will be about 90 fathoms (164^{m}6), if close to the edge of the bank, and from 45 to 55 fathoms (82^{m}3 to 100^{m}6), sand, if inside), haul off to the north-westward, to give the edge a berth of about 10 miles and then steer a mid-channel course.

Having passed Bombay shoal, steer a course parallel with the edge of the bank, preserving a distance of 8 to 12 miles from it, and 27 to 30 miles from the land, or nearer, if convenient, and the peaks on Palawan are sufficiently distinct to get good cross bearings.

It is, however, not desirable to get too close, as the edge of the bank, in about the parallels of 9° 30′ and 10° N., is not uniform in its outline, and several rocky parches lie within a mile, and in some places only 3 cables from the edge.

The course is slightly more northerly when abreast Ulugan bay, where the bank extends 28 miles from the shore.

Proceeding northward from the Palawan passage, it is customary to steer along the west coast of Luzon to Cape Bolinao, lat. 16° 22′ N., and thence direct to Hong Kong, passing to leeward of Pratas island and reef. *See* Note and Caution No. 126.

123. *Sailing-ships.*—For directions for these vessels *see* Routes 1,302, 1,303 and 1,304.

124. Formosa, West coast.—*Shoals.*—Almost the entire west coast of Formosa is extending seaward and new shoals are continually arising; this is especially the case between Anpin ko and Jaian ko. When navigating along this coast, therefore, give it a wide berth, bearing in mind that there is always a current setting inshore.

125. Formosa strait.—*Sailing-ships crossing.*—The crossing of the atrait is attended with considerable trouble at all times of the year, on account of the strong, variable, and sometimes opposite currents setting across the track. This is particularly noticeable at the change of monsoons. In the southern and western part of the strait, a strong drift current setting to leeward (in both monsoons) must be allowed for. *See* China Sea Pilot, Vol. III.

126. Pratas reef (*Lat. 20° 42′ N., Long. 116° 43′ E.*).—This reef lying in the route between Hong Kong and Manila is a serious danger, especially in the North-East Monsoon, when strong gales and thick clouds are sometimes prevalent for weeks together.

Directions.—During the strength of the monsoons, vessels should always endeavour to pass to leeward of Pratas reef, on account of the invariable set of the current to leeward; soundings give no warning of a vessel's approach to it, and the weather is frequently thick and hazy in this vicinity. The safest quarter from which to make the reef is the western, as the island is on this side and the currents set in a north-east or south-west direction, according to the prevailing monsoon; approaching the reef a vessel should be conned from aloft, as with the sun in a favourable position the bottom can be seen in a depth of 10 fathoms (18^{m}3). The island is visible 12 miles in clear weather, but seldom more than 5 miles during the North-East Monsoon haze.

Tide rips.—At distances of from 20 to 50 miles north-westward to north-eastward, through north, of Pratas reef, during the times of various searches being made for reported shoals, the currents in the neighbourhood were found to be exceptionally strong, and tide rips were frequently observed, which occasionally appeared like breakers.

Anchorages.—Although Pratas reef is steep-to in most parts, there are several spots where, in case of necessity, a vessel might find anchorage outside the breakers; particularly on the west side, abreast the middle of the north and south channels over the sunken part of the reef, and at the distance of about 2 and 2½ miles, respectively on either side of the island. At each of these spots there is good anchorage in the North-East Monsoon, in 20 to 10 fathoms ($36^{m}6$ to $18^{m}3$), but the position abreast the south channel is considered the better of the two, the sunken reef at this part being deeper and the bottom more even than in the channel north of the island. There is anchorage in about 20 fathoms ($36^{m}6$), coral and clay, at about one mile westward of the west end of the island. A vessel of light draught might even anchor in safety on the reef in the middle of the south channel entrance, in 3½ fathoms ($6^{m}4$) at low water, or cross it and take up a berth inside the lagoon in 10 fathoms ($18^{m}3$) fine sand.

127. **Socotra rock** (*Lat. 32° 07′ N., Long. 125° 11′ E.*).—This rock is a coral patch over volcanic rock, which extends about a quarter of a mile north-east and south-west, and is about 60 yards wide, with a depth of probably less than 3 fathoms ($5^{m}5$) water. There are depths of 27 to 30 fathoms ($49^{m}4$ to $54^{m}9$) a quarter of a mile around the patch, excepting south-westward, where a rocky ledge, with a least depth of 17 fathoms ($31^{m}1$) extends half a mile. The rock is very steep on its southern and eastern sides.

The tidal streams set strongly over the patch, on which there are overfalls and tide-rips; the sea sometimes breaks on the rock. Possibly, with a favourable light, the greenish colour of the water over the rock might be seen, but only from a very short distance.

A depth of 11 fathoms ($20^{m}1$) obtained by s.s. *Le Bruix*, lies 24 miles, 193° true, and a depth of 17 fathoms ($31^{m}1$) obtained by H.M.S. *Alacrity*, lies 26 miles, 151°, true, from Socotra rock. Soundings are scanty in the vicinity of these shoals.

EASTERN ARCHIPELAGO. *See* Note and Caution 72 and 73 on page 354.

JAPAN

128. **East coast.**—*Gales.—Fogs.—Ice.—Currents.*

Gales.—The east coast of Japan is fully exposed to the strong gales and heavy weather from the eastward prevalent in spring, and the only available harbours are those between Ishi-no-maki kō and Miyako kō.

Fogs.—Fogs are infrequent over the north-western part of the Pacific ocean in winter, but snow often reduces visibility and impedes navigation. In summer fogs are much more frequent, especially off the north-eastern, eastern and south-eastern coasts of Hokkaidō; they are at their maximum in June and July. *See* Japan Pilot, Vols. I. and II., China Sea Pilot, Vols. I. and III., South and East coast of Korea, East coast of Siberia, and Sea of Okhotsk Pilot, and Bering Sea and Strait Pilot, in which full details will be found.

Ice.—*See* remarks in Chapter I. of Section B., Part IV., on page 125 and the appropriate volume of the Admiralty Sailing Directions.

Current.—Those bound to Yokohama are liable to be set from their supposed position by the Kuro shio, but the 10 fathom ($18^{m}3$) contour line is generally about one mile off, and continual sounding may afford warning, as also the temperature of the sea. During the summer months a swell usually causes heavy breakers on this coast.

129. **Naikai or Inland sea.**—The directions for steamships passing the Naikai will be found in Japan Pilot, Vol. II.

Sailing-ship route.—Wind permitting, the route usually followed by sailing vessels, both east and west bound, is as follows.

Entering Naikai through Kii suidō, pass into Ōsaka wan or Izumi nada, through Tomo-ga-shima suidō, and thence northward to Akashi seto. Having passed through Akashi seto, keep northward of Kami shima and all the islands of Ieshima (Iye shima) guntō, and then steer to the south-westward to pass northward of Shōdo shima; after which Bisanseto may be entered by one of the following routes:—

(a) Pass either side of Dango se (*Lat. 34° 31′ N., Long. 134° 05′ E.*), and then turn southward through Ishima suido, between I shima on the west and Te shima on the east, into Bisan seto.

(b) Pass northward of Dango se and I shima; between Tsubone shima and Kyō-no-jōrō (Kionodyoro) shima, and then westward into Katsura shima suidō, which leads southward into the northern part of Bisan seto.

Having entered Bisan seto from (a) or (b), continue westward to pass southward of Mitsugo (Kami-futaomote) shima and of Oki-no su, and then on either side of Takami shima, and southward of Mu shima in Bingo nada.

Steer across Bingo nada to enter Mekari seto, passing northward of Hyakkan shima (*Lat. 34° 18′ N., Long. 133° 16′ E.*). Follow the pecked line shown on the charts through Mekari seto, Aogi seto, Mihara seto and Ōge seto into Aki (Misima) nada. Pass south-westward through Aki nada to enter Iyo nada through Tsurushima suidō in summer, or through Kudako suidō or Nuwashima suidō in winter.

Follow the northern track on the charts passing northward of Sengai se (*Lat. 33° 49′ N., Long. 132° 22′ E.*), and through Heigun suido; thence having passed Amata shima, turn north-westward to enter Suō nada through Hanaguri seto. Keep along the northern side of Suō nada, passing southward of Omo se and Motoyama-no su light, about 3 miles southward of Ube misaki; thence pass out of Naikai through Shimonoseki kaikyō.

CAUTION. Sailing vessels should anchor at night when navigating in Naikai.

Vessels in tow.—These vessels, sometimes as many as ten in number and forming a tow of as much as 440 yds. ($402^{m}3$) in length, may be met in the Naikai. For details of the route followed by these tows, *see* Japan Pilot, Vol. II.

130. **Tsugaru kaikyō and Hakodate.**—*Sailing-ship directions.*

(1) *From the eastward.*—Approaching the strait from the eastward the adverse current will be avoided by keeping near the shore, giving One and the dangers off Ōma saki a berth.

Make Shiriya saki (*Lat. 41° 26′ N., Long. 141° 27′ E.*), bearing about 310°, and pass it at a distance of not less than 2½ miles; when northward of it, keep towards the southern shore to avoid the current and to be in a position to anchor should it be calm. By keeping towards this shore, a vessel may possible be drifted for a considerable distance by the west-going stream, while the north-east current is running strongly in mid-channel of the strait.

Wait at anchor south-eastward of Ōma saki for a favourable opportunity to cross the strait, and as the winds during summer are generally light from the south-westward for a considerable period, freshening a little when the west-going stream makes, this is the proper time to weigh. *See* also Note (2) below.

If proceeding direct for Hakodate from the eastern entrance to Tsugaru kaikyō, proceed as follows:—

After passing 5 miles off Shiriya saki, steer for Esan (Yesan) misaki, so as to take advantage of the cold west-going stream along the south coast of Hokkaidō, remembering that the north-east current is sometimes found close inshore near Shiokubi misaki.

(2) *From Hakodate to the westward.*—Proceeding from Hakodate to the westward, against south-westerly winds, keep near the shore when northward of Yagoshi misaki, and if unable to round it, anchor with a kedge about 2 miles north-eastward of it, weighing again when the next west-going stream makes.

With a light wind a sailing vessel might not clear the strait in one tide, in which case it would be better to wait a tide at anchor, to the eastward of Shirakami saki, and take the whole of the following tide to get sufficiently to the westward, rather than run any risk of being swept back through the strait by the current.

(3) *Tsugaru kaikyō from the westward.*—Approaching the strait from the south-westward during foggy weather, guard against being carried by the current to the northward past the entrance; should the weather be clear when nearing Nyūdō saki, it might be as well to sight it.

In the event of thick weather coming on, when nearing this cape, good though open anchorage in a sandy bottom will be found to the southward of it; but to the northward the bottom is rocky though anchorage is still possible.

Currents.—Tidal streams.—Ice.—See Japan Pilot, Vol. I.

CAUTION. Sailing vessels, passing through the strait, particularly to the westward, should be provided with a good kedge and 150 fathoms (or about 275 metres) of hawser, ready for immediate use, and keep the shore close aboard.

131. KOREA.—Current.—Fog.

Current.—Off the south-west coast of Korea, the current, though not usually of great strength, is very variable, being largely dependent on the wind, and sometimes attains a rate of from 30 to 50 miles a day. The tidal streams must also be considered, as they are rapid.

Fog.—Fog frequently occurs on the west coast of Korea from March to July, and on the south coast from April to August.

132. NEW ZEALAND.—Fog.—Fog is rare, excepting at the south end of New Zealand. In the Bay of Islands, and in Hokianga, there is sometimes a morning fog in September, October and November, which generally clears at 10h. a.m. Dense fog occurs occasionally in winter. In the Bay of Plenty fog has continued for three days in October, but this duration is very unusual. At the southern part of South island and in Foveaux strait, in autumn and winter, with a high barometer and light easterly winds, fog is not uncommon. *See* New Zealand Pilot for further details.

PACIFIC OCEAN, ISLANDS IN THE

133. Friendly islands.—*Dangers.*—Dangers, or possible dangers, have been reported in recent years in the area to the southward and south-eastward of the Friendly islands. Care must be exercised in navigating in the vicinity.

134. Hawaiian islands.

General remarks on winds, currents and sailing passages around the Hawaiian islands.

(*a*) *Winds.*—The easterly trade winds seem to divide at Cape Kumukahi, part following the coast north-westward around Upolu point, where it loses its force, the other part following the south-east coast around Ka Lae, where it also loses its force.

On the west coast of Hawaii the sea breeze sets in about 0900 hours and continues until after sundown, when the land breeze springs up.

Sailing vessels from the westward bound to ports on the windward or south-eastern side of Hawaii should pass close to Upolu point and keep near the coast, as the wind is generally much lighter than offshore. Those from the westward, bound to ports on the eastern side of Hawaii should keep well to the northward until clear of Alenuihaha channel.

Current.—On account of the current, which nearly always sets to the northward along the west coast of Hawaii, it is advisable for sailing vessels to make the land to the southward of their port, as during calms and light airs a vessel is liable to drift to the northward.

Navigational notes.—Alenuihaha channel, which separates Hawaii from Maui and Kahoolawe islands, is 26 miles wide and clear of dangers. During the North-East Trade, the wind frequently blows through the channel with great strength, and there is also a strong current setting westward; but during calms, which frequently follow, there is at times an easterly set of about one knot which, during *kona* winds, may increase to 2 or 3 knots.

Vessels from any of the western ports of Hawaii are therefore recommended to keep close in under the lee of the island until reaching Upolu point, when they will be enabled to fetch across to the Alalakeiki channel on the western side of Maui. Those from the northward, bound to Hilo, will probably find it impossible to weather Upolu point from the western side of Maui, but on getting under the lee of Hawaii the trade wind fails until reaching the southern point of the island, when they will have to beat against wind and current along the south-eastern coast.

PACIFIC OCEAN

135. (a) General remarks.—There are very large areas of the Pacific ocean which are still unsurveyed, or very imperfectly surveyed. In many areas no sounding at all has been recorded.

The presence of a single sounding on the chart can only prove the non-existence of a shoal or reef within a very limited area, an approximation of which is as follows:—

No shoal is likely to exist within a radius of 7 miles of a sounding of 2,000 fathoms (3,657^{m}6); within 3½ miles of a sounding of 1,500 fathoms (2,743^{m}2); or within 2 miles of a sounding of 1,000 fathoms (1,828^{m}8). In 500 fathoms (914^{m}4) a danger may exist within a half or a quarter of a mile or less, such is the precipitous rise of a coral reef or a vigia (*see below*) from the ocean bed.

Many reefs, shoals, or discoloured water were reported in the years 1943 to 1945 when many more vessels were navigating in the Pacific ocean, often off the usual routes.

The routes laid down in this book are those considered most likely to lead clear of dangers, but owing to the imperfect surveys (*see above*), the only safeguard is a good look out. In the interests of all vessels it cannot be stressed too strongly that a sounding should be obtained (from a boat if possible) over any suspected danger.

(b) Coral islands and reefs

Definitions.—Most of the islands and reefs described in this volume are coral structures of the following well-defined types:—

Atoll.—An atoll comprises one or more coral islands, of little elevation, situated on a strip or ring of coral surrounding a central lagoon. The islands of Archipel des Tuamotu are nearly all of this character.

Many of these atolls have passages through the ring of coral reef of sufficient depth to admit the passage of ships to secure and sheltered anchorage in the enclosed lagoon; but in some, the passages admit only boats, while in others the ring is without an opening.

Atollon.—An atollon is a small atoll on the margin of a large one.

Barrier reef.—A barrier reef may front a coastline, or encircle an island or group of islands, leaving a deep channel between it and the shore. The Great Barrier reef of Australia, which extends for about 1,000 miles in a north-westerly direction, at a distance of from 12 to 140 miles from the Queensland coast, is an example of the former, and the Barrier reef surrounding Tahiti, the principal island of Îles de la Société, is an example of the latter. These barrier reefs form natural breakwaters, with passages through them which lead into good harbours; these passages are generally opposite a valley in the land sheltered by the reef. Tidal streams and currents are generally strong and uncertain in these barrier openings.

Fringing reef.—A fringing reef is a coral reef extending from the shore, seldom for a long distance, having little depths of water over it, and no ship passage between it and the land. As the seaward edge of these reefs is generally the highest part, the tide is more or less impounded on some of them, and forms a narrow passage between the edge of the reef and the shore which can usually be navigated by canoes or boats. A coastline with a fringing reef is also frequently fronted by a barrier reef, with a deep passage between them.

Vigias.—A vigia is a reported shoal, the existence or exact locality of which is doubtful.

In no part of the world are there so many dangerous coral reefs and low islets, rising abruptly from great depths, as in the Pacific ocean. In addition, a vast number of vigias have from time to time been reported, and though many have been disproved of late years by laborious research, many others are still indicated on the charts, and until their existence has been disproved, they must remain a source of anxiety and perplexity to the navigator.

Numerous reports of vigias are from the captains of whaling ships, among whom it is a common saying " that they do not care where their ship is so long as there are plenty of whales in sight." Such doubtful navigation, and strong currents, account for a large proportion of vigias that encumber or have encumbered the charts of the Pacific ocean, and those who may observe the appearance of a danger are most earnestly urged to obtain soundings, from a boat if possible.

The semblance of submerged dangers is sometimes caused by reflection from the clouds, by volcanic disturbance, by shoals of fish, and by marine animalculae, all of which often resemble reefs and breakers so closely as to deceive the most experienced. A few examples of such cases are given at the beginning of Chapter II. of Section B., Part IV.

Doubtless many tide-rips and shoals of fish are reported as " breaking reefs." On every occasion of such things being observed, a sounding should be obtained so as to avoid the necessity of a subsequent search for a danger which may have no existence.

(c) Currents among the islands.—Particular and constant attention must be paid to the current when navigating amongst the groups; for, when near the islands, it is sometimes deflected and always accelerated. Again, most of the islands are so low that it is often impossible to see them at night, and ships may be driven on the encircling reefs without any warning from sounding, the reefs having, in general, very deep water close to.

(d) Currents in barrier reef and atoll openings.—The streams in these passages are generally very strong, and cannot be calculated upon to turn with high and low water. Where a barrier reef is near the shore a heavy swell will throw so much water over the reef as to cause a constant set out of the opening, and at times across the fairway; a knowledge of these facts should be borne in mind when navigating such localities; an instance of this latter is very marked at Papeete, in Tahiti; also at Passe de Taapuna in the same island; again at Mururoa; and at many other places too numerous to mention.

(e) Navigation among coral reefs.—As successful navigation through or among coral reefs is often dependent upon the eye, the conditions under which these can be most easily seen are important. Reefs are always more plainly visible from the masthead than from the deck or bridge, and when the sun is high rather than when it is low, also with the sun behind the observer rather than facing him. If the sea is glassy calm, it is extremely difficult to distinguish a reef.

The best conditions, therefore, are with the sun high and behind the observer, and the sea ruffled by a light breeze. Reefs with a depth of about 3 feet ($0^{m}9$) over them then appear to be light-brownish in colour, and those with one fathom ($1^{m}8$) or more, appear to be clear green, deepening to a darker green as the depth increases, and finally to a deep blue when out of soundings.

Under favourable conditions, a shoal with a depth of 3 or 4 fathoms ($5^{m}5$ or $7^{m}3$) over it can be seen from aloft at a considerable distance, but where, and in proportion as, the depths increase beyond this, the bottom will only be seen when nearly over it.

The use of polarised or polaroid glass spectacles is strongly recommended, as they make reefs and shoals stand out much more clearly; with them, such dangers can be seen under conditions when they are invisible to the naked eye.

136. Sailing-ships navigating between the islands.—Within the region of the Trade winds, there is no difficulty in travelling from east to west, the winds being fair.

From west to east for short distances a vessel may beat, but for long distances, as for instance from Fiji to Tahiti, or from Tahiti to Pitcairn island, a vessel should stand southward through the Trade winds into the westerly winds; then run down her easting and re-enter the Trade winds in about the meridian of the island to which bound

137. PHILIPPINE ISLANDS. A description and directions for sailing-ship in the channels and seas among and bordering the Philippine islands, will be found in Chapter II. of Section C., Part II.

138. Flotsam.—Caution.—In navigating the waters of the Philippines during the rainy season a sharp look-out must be kept for flotsam. Trees of immense size will be frequently met afloat. They have been found especially numerous on the south coast of Luzon; in one case, near Marinduque island, a group of them was adrift, still upright and resembling an island.

SOUTH AMERICA WEST COAST

Colombia coast.—For notes on the winds and weather and currents on this coast *see* under Central America (W. coast) and Panama. Note and Caution 116.

SOUTHERN OCEAN. — *Sailing - ship passages around the world.—See* Note and Caution 34.

UNITED STATES WEST COAST

Passages along the coast.—Steamships.

139. *Southward bound.*—Keep within 15 miles of the coast, in order to avoid the heavy seas felt farther out. A south going current will be experienced throughout the whole distance to the entrance of Panama bay; but after passing Cape Blanco (*Lat. 42° 52′ N.*) the Davidson current, north-going, will be felt within 10 miles of the coast.

140. *Northward bound.*—Along the Californian coast and to the northward, steamers should follow the coast from point to point, as nearly as possible, always within 15 miles of the land. By this means the strong north-west wind will frequently be avoided, as calms will often be found close in with the shore when there is a wind to seaward. The north-going Davidson current will be felt, also, within 10 miles of the coast, as far north as Cape Blanco.

141. San Francisco approach.—The Farallones.—Off San Francisco in clear weather, vessels may pass midway between South and Middle Farallones in 18 fathoms ($32^{m}9$), or midway between Middle and North Farallones, in 36 fathoms ($65^{m}8$), but the more prudent course is to keep to the southward of South Farallon.

At night and in thick weather vessels should always go to southward of South Farallon.

Fog.—The Farallones are frequently enveloped in fog, and therefore in approaching them in such weather the utmost care and vigilance must be observed, the more especially as the peculiarities of the ocean currents in the vicinity have not been determined.

142. *Cape Mendocino* (*Lat. 40° 26′ N., Long. 124° 24′ W.*).—*Fogs.*—Fogs form about Cape Mendocino and bank against it densely. Sometimes a vessel will carry clear weather from Juan de Fuca strait to the cape and then encounter fogs that reach to San Francisco.

See also Routes 740 and 741.

PUBLICATIONS
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A complete list of the Sailing Directions, Charts and other works published by the Hydrographic Department of the Admiralty, together with a list of Agents for their sale, is contained in the "Catalogue of Admiralty Charts and other Hydrographic publications," published annually.

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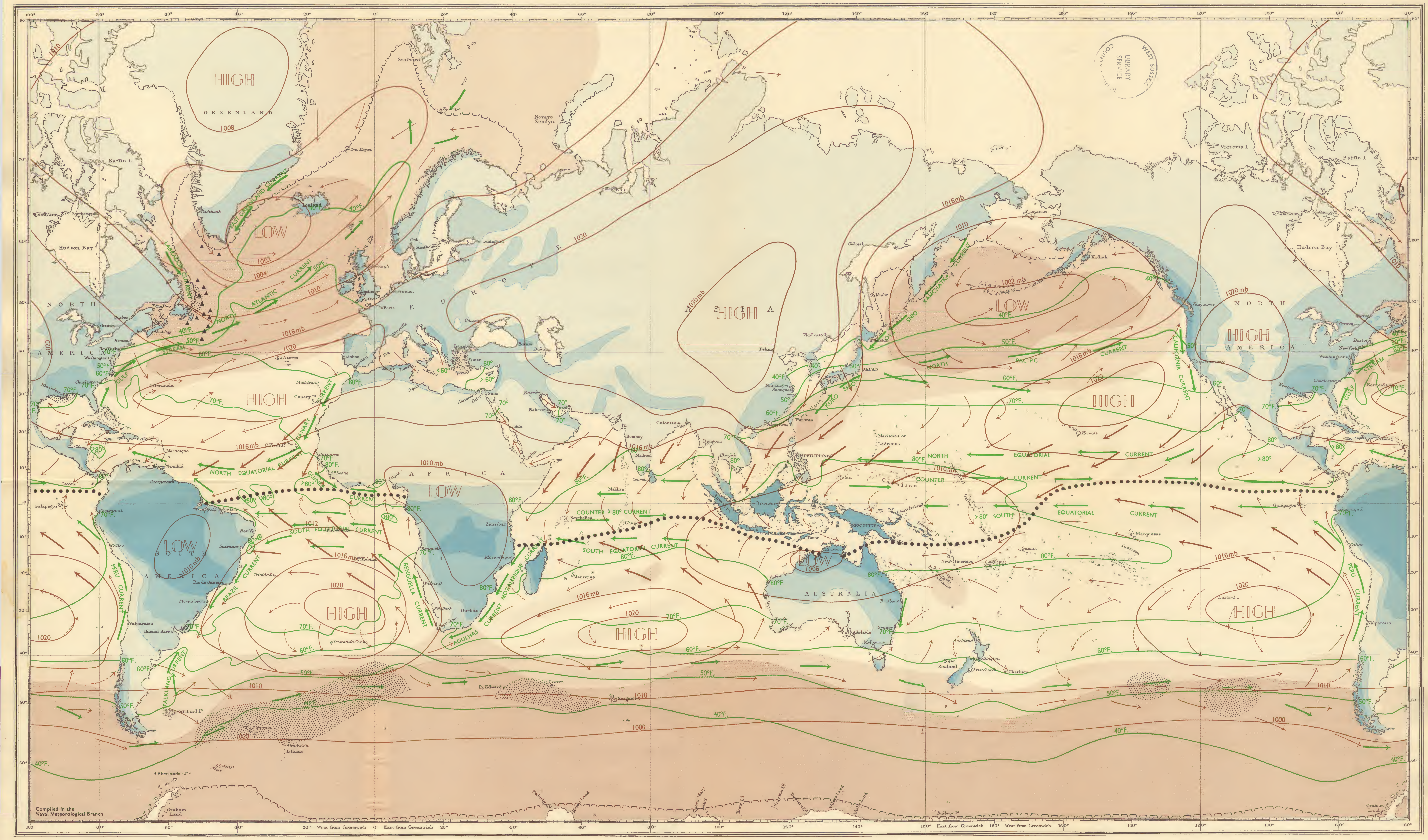
WORLD CLIMATIC CHART — SHEET 1. JANUARY



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EXPLANATORY NOTES : GENERAL.

The information incorporated in this chart deals with average, not actual, conditions and this is therefore a Climatic, and not a Weather Chart.

With the exception of the ice-limits, which do not reach their "peak" until April, the chart represents the characteristic state of affairs at about the height of the northern winter and southern summer.

For detailed information about any particular part of the world, reference should be made to the appropriate Weather Handbooks, Climatic and Current Atlases, Admiralty Pilots and Ice Charts.

PRESSURE. Pressure, like wind, is a variable quantity. On any given day in January the actual pressures recorded and the arrangement of the lines of equal pressure (=isobars) may be quite different from those shown on this chart. This is especially likely to be the case with the "travelling Lows" (or depressions) which usually move from West to East across the temperate zone. The "Highs" (or anticyclones) are much less mobile and their day-to-day variations of pressure much smaller. This is the main reason why the Trades, for instance, are steadier in force and direction than the Westerlies of the North Atlantic.

1016mb

WINDS. The arrows give a general picture of the prevailing winds over the oceans. Where these winds are unusually steady, as in the Trades, the arrows have been strengthened: in such cases it can be assumed that the winds blow in the direction indicated on more than 2/3rds of all occasions. Where the arrows are broken or omitted altogether, as in the heart of the High and Low pressure areas, there the winds are variable.

GALE FREQUENCY. Gales and low pressures usually go together: this is the main reason why they are mostly confined to the extra-tropical depresssion zones of the world. Winds of force 7 or more occur on more than 10 days a month in the darker-tinted areas. Such winds occur on 5 - 10 days a month in the lighter-tinted areas.

SWELL. No attempt has been made to show the distribution of swell, but it can be inferred broadly from information on the chart. Low or moderate swell is liable to occur to leeward of all the main wind belts: there is, for instance, a persistent short and low—at times moderate—swell along the E. African coast during the N.E. monsoon. Heavy swell is generally only produced in the extra-tropical gale zones: however, in favourable circumstances it penetrates up to 3,000 miles beyond the confines of these zones. These circumstances are most likely to arise in the rear of eastward-moving depressions where, in the Northern Hemisphere, the winds are N.W'ly and in the Southern Hemisphere, S.W'ly. From this it follows (i) that heavy swell is more likely to out-run the gale zones on their tropical, than on their poleward flanks, and (ii) that it is more likely to be experienced in the eastern than in the western side of the oceans.

TROPICAL STORMS. In low latitudes gales are almost entirely confined to those areas frequented by tropical storms. In a normal year the number of such storms seldom exceeds two a month in any one area. In the S. Indian and Pacific Oceans the cyclone season usually lasts from December to April: in the South Atlantic and north of the equator there are generally no tropical storms at this season of the year.

DOLDRUMS. (February) • • • • • • • Weather in the Doldrums is essentially changeable. Its leading characteristics are light, variable winds, frequent calms alternating with squalls, heavy rains and thunderstorms (worse by night than by day).

CURRENTS. Only the location and direction of the main ocean currents are indicated. Except where the winds are generally light and/or variable, as in the vicinity of the Equatorial Counter Currents, there is close agreement between the direction of the current and that of the prevailing wind. A direct result of this is that, according to whether the wind blows from warmer to cooler latitudes, or vice versa, the surface water temperatures will be above, or below, the average for the latitude. Some idea of the relative warmth or coldness of the currents is given by the extent to which the sea isotherms in the vicinity of the current arrows bend polewards or equatorwards respectively: thus the Benguella Current is obviously cold, the Agulhas Current warm.

SEA TEMPERATURE. Unlike pressure and winds, the day-to-day variation of sea temperature is very small: monthly changes of more than 2°—3° F. are unusual, and year-to-year departures from the mean monthly value are of the same low order.

80°F.

In the open ocean, and along leeward shores, sea and air temperatures agree fairly closely (within 2° or so); thus the January sea temperature off Scilly is approx. 48°—50° F. and the average air temperature for the same place 46° F. Along windward shores, especially in high latitudes, differences up to 20°—30° F. are not uncommon. Sometimes the air will be this much colder than the sea (e.g. in high latitudes in winter): at others (e.g. in summer along the west coast of S. Africa) the sea will have the lower temperature.

FOG. Sea fog is likely to form wherever warm air passes over cold water; it is most likely to be persistent where the sea isotherms lying athwart the track of a wind blowing from warmer to colder waters are packed closely together. Areas in which sea fog may be encountered on at least 5 days a month are indicated by a light stipple.

ICE is about the most variable of all the elements depicted on this chart. The year-to-year fluctuations in the limit of pack-ice (or icebergs for that matter) are often very considerable. For instance, in some seasons Jan Mayen remains almost completely ice-free: in others it cannot be approached by a ship not specially strengthened, until July.

Outer limit of pack-ice (March-April)

Iceberg zone (May) ▲

Icebergs (formed by the "calving" of ice from continental ice-caps and valley glaciers) are liable to be encountered beyond the pack-ice limits at all seasons of the year, but mostly in early summer. They melt fast once they have drifted into comparatively warm water, e.g. the Gulf Stream.

RAINFALL. This is another uncertain quantity, and the amount falling in a particular January may bear little relation to the averages shown above: especially is this the case with areas lying near the lower limit of the 1"—4" zone. Over the oceans the only habitually rainy areas are the Doldrums and the storm (depression) belts of middle and high latitudes. The Trades and N.E. Monsoon, blowing, it will be noticed, off arid lands, are practically rainless.

Over 8" in Jan.
4" to 8"
1" to 4"
Less than 1"

Small corrections-1948-1956 1949-6·20-1961-2·17

London — Published at the Admiralty, 30th April 1943, under the Superintendence of Vice-Admiral Sir John Edgell, K.B.E., C.B., F.R.S., Hydrographer.

New Edition 29th Novr, 1946

Enamel 1956

5301

Z. 2·61

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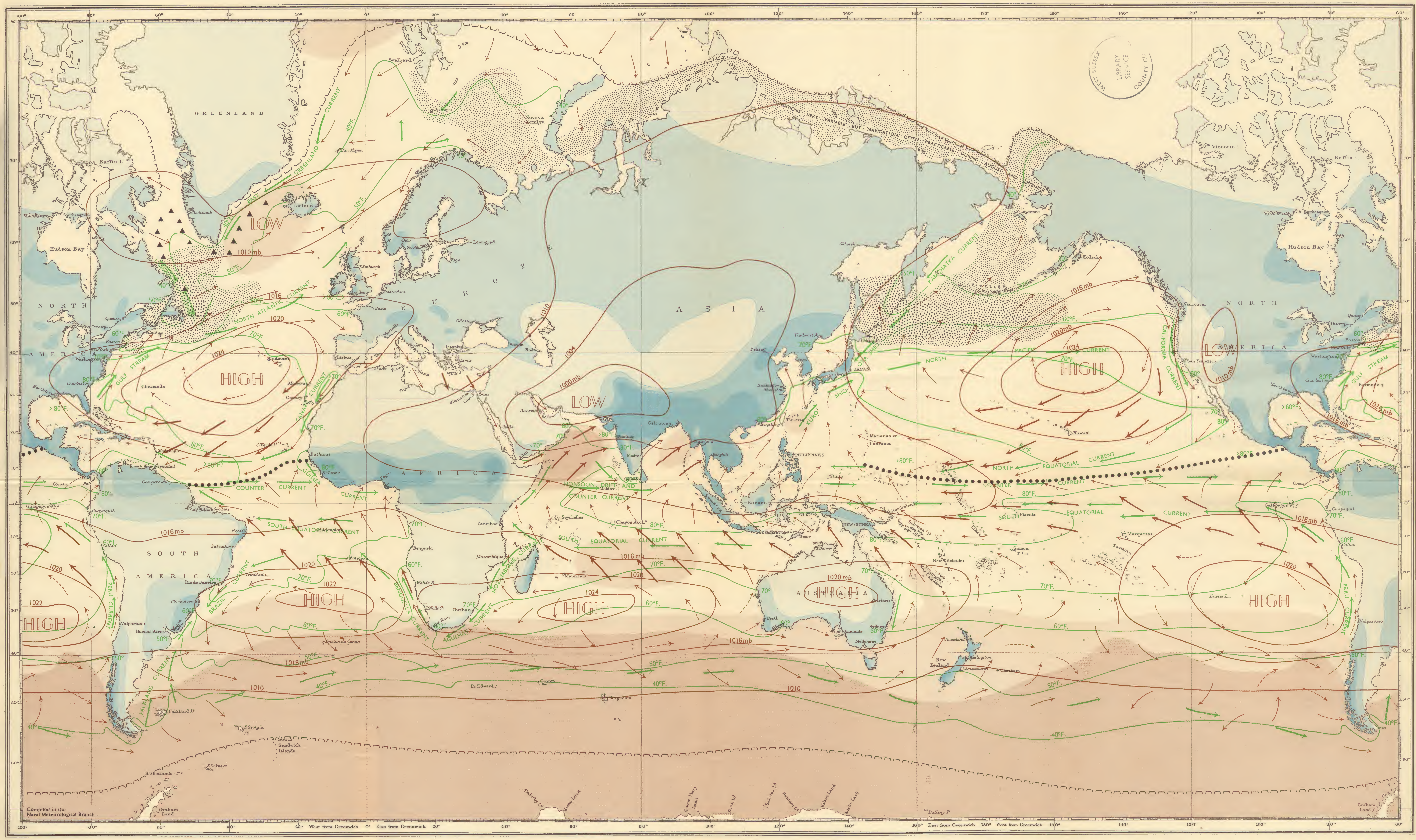
WORLD CLIMATIC CHART — SHEET 2. JULY



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EXPLANATORY NOTES : GENERAL. The information incorporated in this chart deals with average, not actual, conditions and this is therefore a Climatic, and not a Weather Chart.

With the exception of the ice-limits, which do not reach their "peak" until September, the chart represents the characteristic state of affairs at about the height of the northern summer and southern winter.

For detailed information about any particular part of the world, reference should be made to the appropriate Weather Handbooks, Climatic and Current Atlases, Admiralty Pilots and Ice Charts.

PRESSURE. Pressure, like wind, is a variable quantity. On any given day in July the actual pressures recorded and the arrangement of the lines of equal pressure (=isobars) may be quite different from those shown on this chart. This is especially likely to be the case with the "travelling Lows" (or depressions) which usually move from West to East across the temperate zone. The "Highs" (or anticyclones) are much less mobile and their day-to-day variations of pressure much smaller. This is the main reason why the Trades, for instance, are steadier in force and direction than the Westerlies of the North Atlantic.

1016mb

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TROPICAL STORMS. In low latitudes gales are almost entirely confined to those areas frequented by tropical storms. In a normal year the number of such storms seldom exceeds two a month in any one area. In the N. Indian and Pacific Oceans the cyclone season usually lasts from May to November: in the N. Atlantic from July to October. South of the equator there are no tropical storms at this (winter) season of the year.

DOLDRUMS. Weather in the Doldrums is essentially changeable. Its leading characteristics are light, variable winds, frequent calms alternating with squalls, heavy rains and thunderstorms (worse by night than by day). In the Indian and W. Pacific Oceans the Doldrum belt disappears from June to September.

(August) ● ● ● ● ● ● ● ●

CURRENTS. Only the location and direction of the main ocean currents are indicated. Except where the winds are generally light and/or variable, as in the vicinity of the Equatorial Counter Currents, there is close agreement between the direction of the current and that of the prevailing wind. A direct result of this is that, according to whether the wind blows from warmer to cooler latitudes, or vice versa, the surface water temperatures will be above, or below, the average for the latitude. Some idea of the relative warmth or coldness of the currents is given by the extent to which the sea isotherms in the vicinity of the current arrows bend polewards or equatorwards respectively: thus the Benguella Current is obviously cold, the Agulhas Current warm.

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80°F.

In the open ocean, and along leeward shores, sea and air temperatures agree fairly closely (within 2° or so); thus the July sea temperature off Scilly is approx. 58°—60° F. and the average air temperature for the same place 61° F. Along windward shores, especially in high latitudes, differences up to 20°—30° F. are not uncommon. Sometimes the air will be this much colder than the sea (e.g. in high latitudes in the winter hemisphere): at others (e.g. in summer along Trade wind coasts) the sea will have the lower temperature.

FOG. Sea fog is likely to form wherever warm air passes over cold water; it is most likely to be persistent where the sea isotherms lying athwart the track of a wind blowing from warmer to colder waters are packed closely together. Areas in which sea fog may be encountered on 5—10 days a month are indicated by a light stipple: for 10—20 days a month areas are shown by a darker stipple.

ICE is about the most variable of all the elements depicted on this chart. The year-to-year fluctuations in the limit of pack-ice (or icebergs for that matter) are often very considerable. For instance, in some seasons Jan Mayen remains almost completely ice-free: in others it cannot be approached by a ship not specially strengthened, until July.

Outer limit of pack-ice (Aug.-Sept.)

Iceberg zone (October) ▲ ▲ ▲ ▲

Icebergs (formed by the "calving" of ice from continental ice-caps and valley glaciers) are liable to be encountered beyond the pack-ice limits at all seasons of the year, but mostly in early summer. They melt fast once they have drifted into comparatively warm water, e.g. the Gulf Stream.

RAINFALL. This is another uncertain quantity, and the amount falling in a particular July may bear little relation to the averages shown above: especially is this the case with areas lying near the lower limit of the 1"—4" zone. Over the oceans the only habitually rainy areas are the Doldrums and the storm (depression) belts of middle and high latitudes. The N.E. and S.E. Trades, blowing, it will be noticed, off arid lands, are practically rainless.

Over 8" in July
4" to 8"
1" to 4"
Less than 1"

Small corrections - 1948-1956 1949-6·20-1961-2·17

London — Published at the Admiralty, 30th April 1943, under the Superintendence of Vice-Admiral Sir John Edgell, K.B.E., C.B., F.R.S., Hydrographer.

New Edition 29th Novr. 1946

Enamel 1956

5302

Z.2-61

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THE WORLD

GENERAL SURFACE CURRENT CIRCULATION

To accompany the Book on "Ocean Passages—Winds and Currents" published by the Admiralty

The circulation of the south-west monsoon period in the North Indian Ocean and China Seas is shown on the main chart. The circulation of the north-east monsoon period in these areas is given on the inset chartlet. In the Eastern Archipelago and the region north of New Guinea the circulation of both monsoon periods is shown on the main chart, that of the north-east monsoon period being indicated by pecked lines

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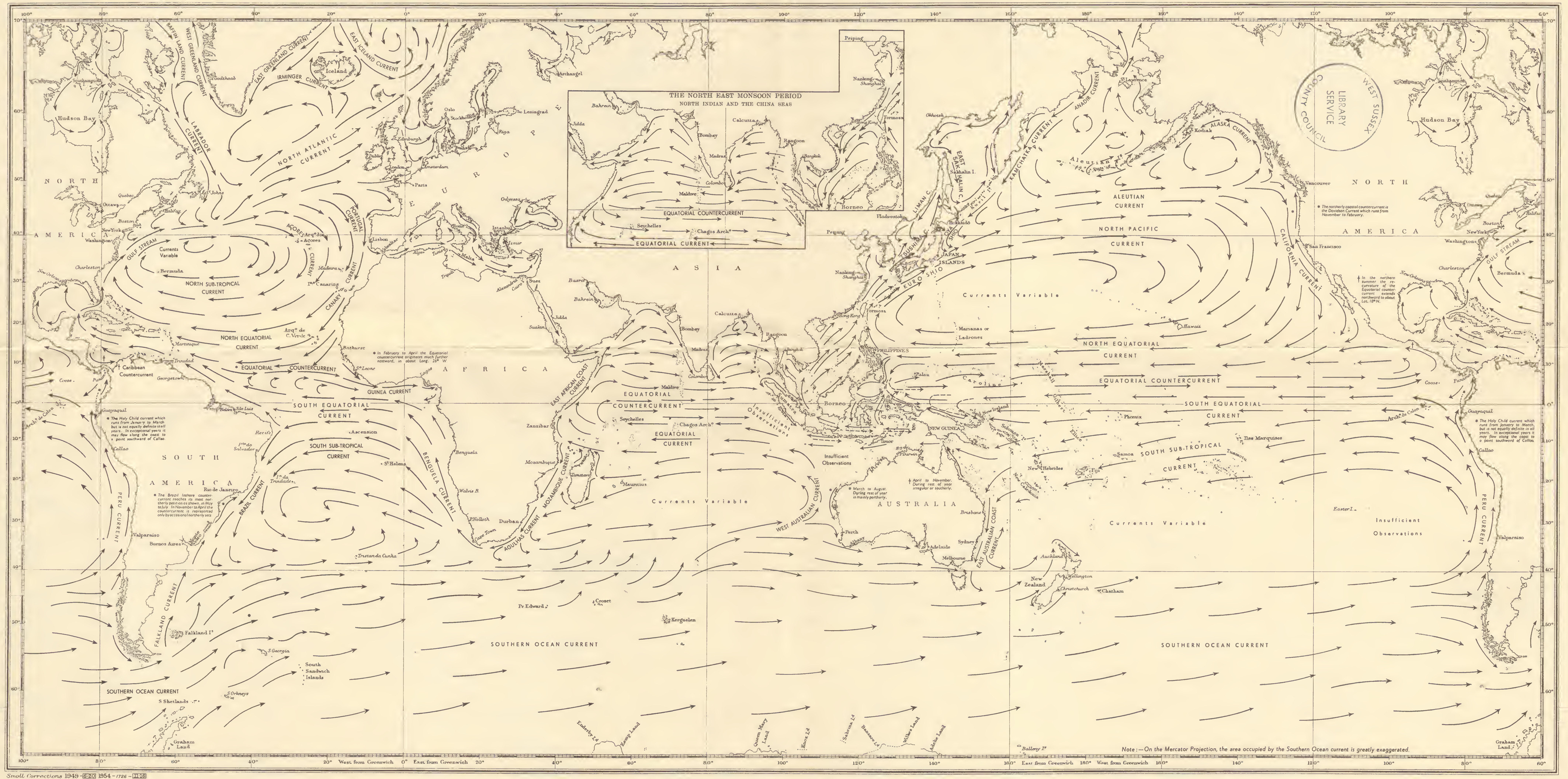

* The Holy Child current which runs from January to March but is not equally definite in all years. In exceptional years it may flow along the coast to a point southward of Callao.

* The Brazil Inshore countercurrent reaches its most northerly position as shown, in May to July. In November to April the countercurrent is represented only by occasional northerly sets

* In February to April the Equatorial countercurrent originates much further eastward, in about Long. 26° W.

* March to August. During rest of year is mainly northerly.

† April to November. During rest of year irregular or southerly.

* The northerly coastal countercurrent is the Davidson Current which runs from November to February.

† In the northern summer the recurvature of the Equatorial countercurrent extends northward to about Lat. 18° N.

Note:—On the Mercator Projection, the area occupied by the Southern Ocean current is greatly exaggerated.

Small Corrections 1949-6·20 1954-1726-11·16

London. Published at the Admiralty, 11th Feby 1949, under the Superintendence of Vice-Admiral A. G. N. Wyatt, C.B., Hydrographer.
From a chart prepared in the Meteorological Office, Air Ministry.
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Z/en 1957

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180.62

NOTE

The North Atlantic Lane Routes will be found on charts 2058B and 2058C. These charts show the seasonal routes westward and eastward bound between the British Isles and Canada and the United States.

NOTE

For routes in the Pacific Ocean, see Chart No 5307.

NOTE

For routes in the Indian Ocean see Chart No 5306.

Table for Conversion of Distances

Miles	Kilometres	Miles	Kilometres
1	1·85	75	138·99
5	9·27	80	148·25
10	18·53	85	157·52
15	27·80	90	166·79
20	37·06	95	176·05
25	46·33	100	185·32
30	55·60	200	370·64
35	64·86	300	555·95
40	74·13	400	741·27
45	83·39	500	926·59
50	92·66	600	1111·91
55	101·92	700	1297·23
60	111·19	800	1482·54
65	120·48	900	1667·86
70	129·72	1000	1853·18

Distances in nautical miles from Plymouth to certain ports

Plymouth to	(1) via Suez Canal			(2) via Cape of Good Hope			(3) via Panama Canal		
	direct	calling at certain ports	Ports called at	direct	calling at certain ports	Ports called at	direct	calling at certain ports	Ports called at
Bombay	6,000	6,010	Gibraltar, Aden	10,430	10,450	Las Palmas, Cape Town			
Colombo	6,440	6,450	,, ,,	10,190	10,210	,, ,,			
Calcutta	7,650	7,690	,, ,, Colombo	11,320	11,460	,, ,, Colombo			
Singapore	7,970	8,020	,, ,,	11,440	11,460	,, ,,			
Hong Kong	9,430	9,480	,, ,, Singapore	12,750	12,920	,, ,, Singapore	13,700	14,050	Honolulu
Shanghai	10,160	10,300	,, ,, ,, Hong Kong	13,470	13,750	,, ,, ,, Hong Kong	13,070	13,510	,,
Yokohama	10,860	11,060	,, ,, ,, ,,	14,180	14,510	,, ,, ,, ,,	12,180	12,570	,,
Melbourne	10,790	11,250	,, ,, Fremantle	11,680	11,700	,, ,,	12,460	12,550	Rapa, Wellington
Sydney	11,260	11,830	,, ,, ,, Melbourne	12,140	12,280	,, ,, Melbourne	12,170	12,320	Tahiti
Wellington	12,170	12,740	,, ,, ,, ,,	12,850	12,870	,, ,,	10,990	11,060	Rapa

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STEAMSHIP ROUTES
ATLANTIC OCEAN

North-going and East-going Tracks are shown thus:- ....
South-going and West-going Tracks are shown thus:- _ _ _ _ _ _ _ _ _ _ _ _ _ _
Routes which follow the same Track both ways for a PART of the year are shown thus:- ._._._._._._._.
Routes which follow the same Track both ways for ALL SEASONS of the year are shown thus:- ______________

Arrow heads on the tracks further indicate the direction in which the ship should be heading. Small circles indicate points at which two or more Tracks converge or where two Great Circle arcs meet, or where a Great Circle arc joins with a Rhumb Line in a Composite Track.

MEMORANDUM

The Routes recommended for LOW POWERED STEAMERS *(sea speed below 10 knots) are specially indicated; otherwise the Routes are those proposed for all classes of steamers. Where Alternative Routes are given these are usually followed by* MODERATE POWERED STEAMERS *(sea speed of from 10 to 15 knots).*
As far as possible the Routes are Great Circles and are indicated as such on the tracks concerned. Distances are based on the Admiralty Distance Tables and are given to the nearest five miles. Owing to the avoidance of contrary currents, seasonal changes, etc, the distances given on certain routes are slightly greater than the shortest distances as given in the Admiralty Distance Tables. All the Ports connected by the routes are re-fuelling stations.
For further information see "Ocean Passages for the World" published by the Hydrographic Dept. Admiralty.

EXPLANATION

(1). To find the time taken to traverse a given distance at a given speed.
Join speed to ⊕ at bottom left hand corner of diagram; where this line meets the distance projected horizontally from the left hand scale, will be found the number of days required.

(2). To find to what speed it is necessary to increase or decrease so as to cover a given distance in a lesser or greater time.
Mark off on the horizontal line the number of days as in (1); then on the same line measure to the left or the right the lesser or the greater number of days given. Join this point to ⊕ and produce this line to the speed scale which will then give the speed required.

(3). To find at what speed a vessel must steam to cover a given distance in a given time.
Mark the point of intersection made by the horizontal line representing the distance and the number of days given. Join this point to ⊕ and produce this line to the speed scale which will then show the speed the vessel must make.
NOTE _ *If the distances are small multiply by 10 and divide the result by 10.*

Small corrections - 1951 -

London _ Published at the Admiralty 6th Decr 1946, *under the Superintendence of* Rear-Admiral A.G.N. Wyatt, *Hydrographer.*
New Editions 9th June 1950. Large Corrections
(36·88 x 26·47)
Engraved 1933.
Zc 1950

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NOT TO BE USED FOR NAVIGATION

STEAMSHIP ROUTES
INDIAN OCEAN

North-going and East-going Tracks are shown thus:-.......................................
South-going and West-going Tracks are shown thus:-_ _ _ _ _ _ _ _ _ _ _ _ _ _ _
Routes which follow the same Track both ways for a PART of the year are shown thus:- .__.__.__.__.__.__.__.
Routes which follow the same Track both ways for ALL SEASONS of the year are shown thus:- ____________________

Arrow heads on the tracks further indicate the direction in which the ship should be heading. Small circles indicate points at which two or more Tracks converge or where two Great Circle arcs meet, or where a Great Circle arc joins with a Rhumb Line in a Composite Track.

MEMORANDUM

The Routes recommended for LOW POWERED STEAMERS *(sea-speed below 10 knots) are specially indicated; otherwise the Routes are those proposed for all classes of steamers. Where Alternative Routes are given these are usually followed by* MODERATE POWERED STEAMERS *(sea-speed of from 10 to 15 knots)*
As far as possible the Routes are Great Circles and are indicated as such on the tracks concerned. Distances are based on the Admiralty Distance Tables and are given to the nearest five miles. Owing to the avoidance of contrary currents, seasonal changes, etc., the distances given on certain routes are slightly greater than the shortest distances as given in the Admiralty Distance Tables. All the Ports connected by the routes are re-fuelling stations.
For further information see "Ocean Passages for the World" published by the Hydrographic Department, Admiralty.

Distances in nautical miles from Plymouth to certain ports.

Plymouth to	(1) via Suez Canal			(2) via Cape of Good Hope			(3) via Panama Canal		
	direct	calling at certain ports	Ports called at	direct	calling at certain ports	Ports called at	direct	calling at certain ports	Ports called at
Bombay	6000	6010	Gibraltar, Aden	10,430	10,450	Las Palmas, Cape Town			
Colombo	6,440	6,450	" "	10,190	10,210	" "			
Calcutta	7,650	7,690	" " Colombo	11,320	11,460	" " Colombo			
Singapore	7,970	8,020	" " "	11,440	11,460	" "			
Melbourne	10,790	11,250	" " " Fremantle	11,680	11,700	" "	12,460	12,550	Rapa, Wellington
Sydney	11,260	11,830	" " " " Melbourne	12,140	12,280	" " Melbourne	12,170	12,320	Tahiti

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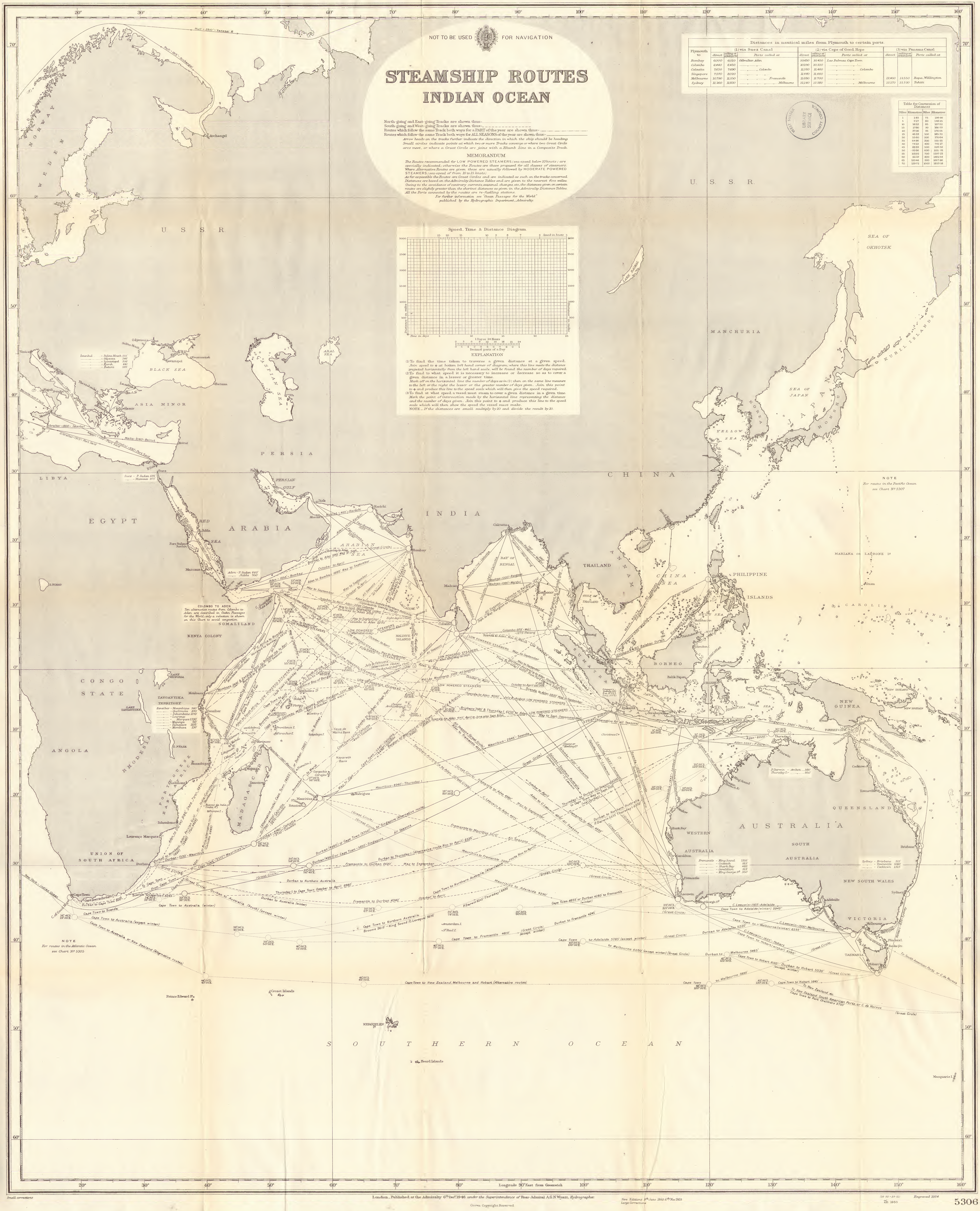

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Small corrections

London _ Published at the Admiralty 6th Decr 1946 under the Superintendence of Rear-Admiral A.G.N. Wyatt, Hydrographer.

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New Editions 9th June 1950 6th Nov 1953.
Large Corrections
(26·22 - 29·51)
Zc 1950
Engraved 1934

5306

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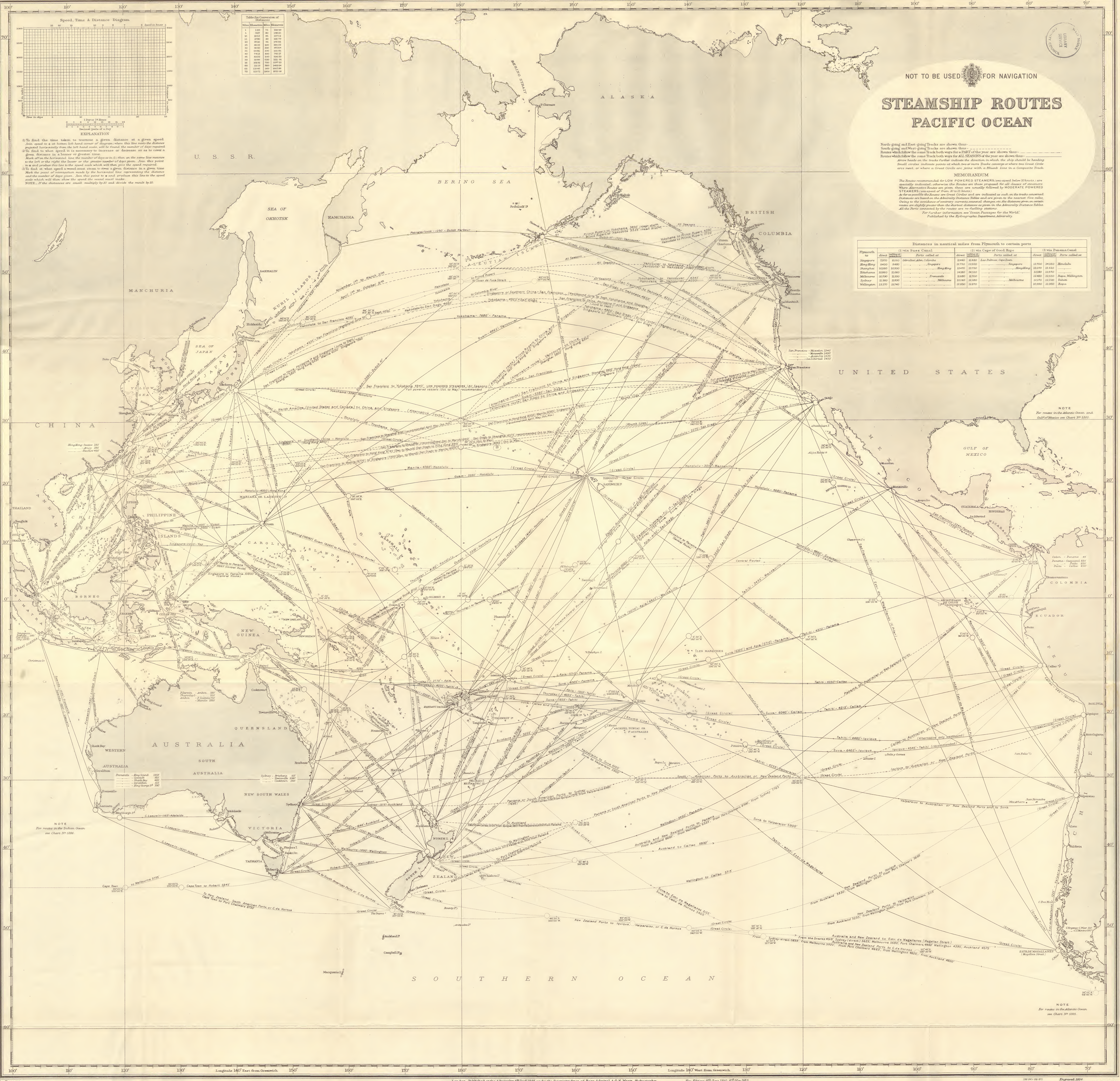
NOT TO BE USED FOR NAVIGATION

STEAMSHIP ROUTES
PACIFIC OCEAN



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Published by the Hydrographic Department, Admiralty.

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Shanghai	10,160	10,300	……, ……, ……, …… Hong Kong	13,470	13,750	……, ……, …… Hong Kong	13,070	13,510	……, ……
Yokohama	10,860	11,060	……, ……, ……, ……, ……	14,180	14,510	……, ……, ……, ……, ……	12,180	12,570	……, ……
Melbourne	10,790	11,250	……, ……, …… Fremantle	11,680	11,700	……, ……	12,460	12,550	Rapa, Wellington
Sydney	11,260	11,830	……, ……, ……, …… Melbourne	12,140	12,280	……, …… Melbourne	12,170	12,320	Tahiti
Wellington	12,170	12,740	……, ……, ……, ……, ……	12,850	12,870	……, ……	10,990	11,060	Rapa

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55	101·92	700	1297·23
60	111·19	800	1482·54
65	120·46	900	1667·86
70	129·72	1000	1853·18

Speed, Time & Distance Diagram

EXPLANATION

(1) To find the time taken to traverse a given distance at a given speed
Join speed to ⊕ at bottom left hand corner of diagram; where this line meets the distance projected horizontally from the left hand scale, will be found the number of days required

(2) To find to what speed it is necessary to increase or decrease so as to cover a given distance in a lesser or greater time.
Mark off on the horizontal line the number of days as in (1); then on the same line measure to the left or the right the lesser or the greater number of days given. Join this point to ⊕ and produce this line to the speed scale which will then give the speed required.

(3) To find at what speed a vessel must steam to cover a given distance in a given time
Mark the point of intersection made by the horizontal line representing the distance and the number of days given. Join this point to ⊕ and produce this line to the speed scale which will then show the speed the vessel must make.

NOTE _ *If the distances are small multiply by 10 and divide the result by 10.*

NOTE
For routes in the Atlantic Ocean and Gulf of Mexico see Chart No 5301.

NOTE
For routes in the Indian Ocean see Chart No 5306.

NOTE
For routes in the Atlantic Ocean see Chart No 5301.

Small corrections

London _ Published at the Admiralty 6th Decr 1946, *under the Superintendence of* Rear-Admiral A.G.N. Wyatt, *Hydrographer.*

New Editions 9th June 1950, 6th Nov 1953.
Large Corrections

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5307

THE WORLD
SAILING SHIP ROUTES

PREPARED BY REAR ADMIRAL BOYLE T. SOMERVILLE. C.M.G.

This Chart illustrates the more important routes described
in the book of "Ocean Passages" published by the Admiralty, 1950

MEMORANDUM.

The Routes here shown are those in modern use for Sailing Ships, on Ocean Voyages. Short, or coasting voyages are not shown, nor voyages entirely or chiefly to windward, (as for example, from Bombay to Aden in the S.W. Monsoon), these now being seldom undertaken by Sailing Ships.

North-going Routes are tinted Pink, with Direction-arrows, and Months in Carmine.
South-going " " " Grey, " " " " " " Dark Grey.
East-going " " " Yellow, " " " " " " Dark Yellow.
West-going " " " Brown, " " " " " " Dark Brown.

The tinted Route-zones indicate by their breadth the limits between which the Tracks are usually made.
In cases where routes between two ports vary according to season of the year the name of the appropriate month or months, written along it, indicates the track which should be taken at those periods.
The routes shown are based on general experience but owing to the variability of winds in all latitudes, departure from the tracks here recommended may often be necessary.
The "Alternative" tracks shown are those preferred by some navigators, instead of the Routes in general use.

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Small corrections 1947-[1·6] - 1948-*1956*-[8·31] -1950- [5·26]

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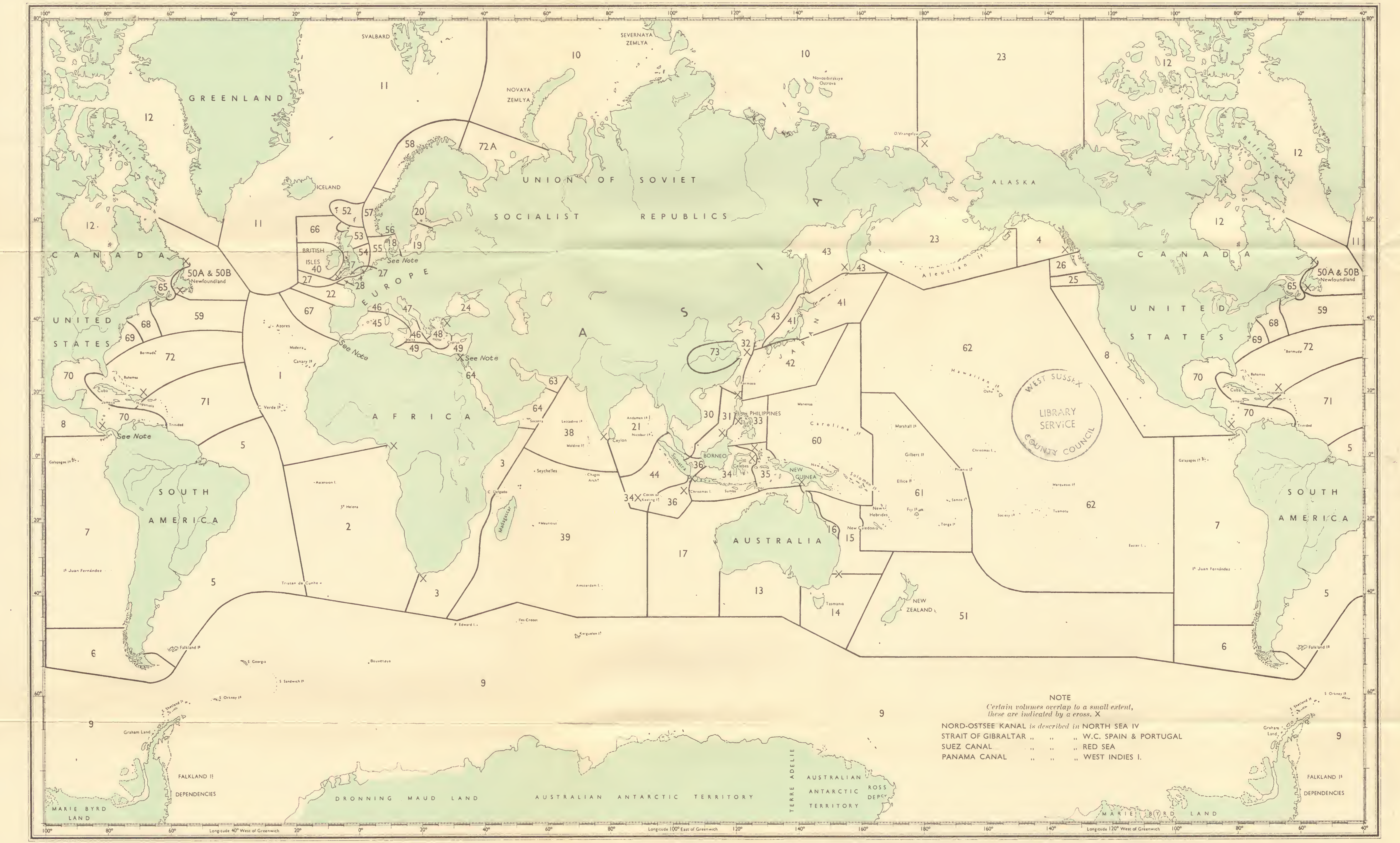

NOTE

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